June 30, 1998 SECY-98-158

FOR: The Commissioners

FROM: L. Joseph Callan /s/
Executive Director for Operations

SUBJECT: RULEMAKING PLAN FOR IMPLEMENTATION OF REVISED SOURCE TERM AT OPERATING REACTORS

PURPOSE:

To obtain Commission approval to proceed with the development of rulemaking to provide for the voluntary implementation of a revised accident source term at operating power reactors. This Rulemaking Plan is in response to the staff requirements memorandum dated February 12, 1997 (SECY-96-242) and, in addition, addresses needed conforming changes for Part 52.

BACKGROUND:

Current operating light-water reactors were licensed, in part, on the basis of safety analyses that used fission product release assumptions presented in the Technical Information Document (TID) 14844, "Calculation of Distance Factors for Power and Test Reactor Sites" (1962). Although initially applied to the evaluation of proposed reactor sites, these fission product release assumptions, known collectively as the "source term," have been used in several regulatory applications related to light-water reactors. This source term was a key input to many of the design analyses associated with currently operating reactors and is a significant component of the design basis for these facilities. During the period since the publication of TID-14844, significant advances have been made in understanding the timing, magnitude, physical form, and chemical form of fission product releases from severe nuclear power plant accidents. In 1995, the NRC published NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants," which utilized these source term insights to produce revised estimates of the accident source term.

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The industry has expressed an interest in using these revised source term insights for design basis accident (DBA) evaluations performed in support of plant, technical specification, and procedure modifications at a number of operating nuclear power plants. By letter dated July 27, 1994, the NRC staff invited the Nuclear Energy Institute (NEI) to serve as a focal point for discussions with the nuclear industry. The industry and the NRC staff have met several times. In November 1995, NEI submitted a generic framework for applying source term insights to operating reactors. In SECY-96-242, dated November 25, 1996, the NRC staff informed the Commission of the staff's intent to allow the use of the revised accident source terms in design basis analyses for operating reactors. The staff requirements memorandum on SECY-96-242, dated February 12, 1997, directed the NRC staff to undertake a rebaselining study at two reactors and to prepare a rulemaking plan. This paper responds to the Commission's request for a rulemaking plan. The results of the rebaselining study are being submitted to the Commission in a separate paper.

In SECY-94-300, the NRC staff concluded that the existing analytical approach based on the TID-14844 source term continues to be adequate to protect public health and safety and that the staff did not intend to backfit the revised source term, or related changes in dose guidelines, on operating reactors. This rulemaking would allow operating reactors to voluntarily implement the revised source term as a replacement for the TID-14844 source term in the facility's design basis. In preparing this Rulemaking Plan, the NRC staff determined that the revised source term could be implemented without a rule change. However, in SECY-96-242, the NRC staff recommended consideration of a requirement that accident analyses based on the revised source term assess consequences in terms of total effective dose equivalent (TEDE) and, for the exclusion area boundary dose, the worst two-hour dose. The staff requirements memorandum on SECY-96-242 directed the NRC staff to incorporate these concepts into the requested rulemaking.

In the Westinghouse AP600 certification reviews, the NRC staff identified the need for conforming changes to Part 50 in order to avoid the need for exemptions for future Part 52 applicants (including design certification applicants). The need for these changes was not recognized during the Part 50 and Part 100 rulemaking. The proposed rulemaking also addresses the need for these conforming changes.

DISCUSSION:

The Rulemaking Plan (Attachment 1) takes into consideration the source term insights reported in NUREG-1465, the industry and NRC staff experience with certification reviews for the ABB/CE System 80+ and AP600 advanced light-water reactors, the industry's proposed generic framework document, the previous Part 100 and §50.34 rule changes associated with future reactors, and the results from the rebaselining study. The NRC staff also had the benefit of several discussions with NEI and representatives on the industry's source term task force. In parallel with the development of this rulemaking, the NRC staff will be reviewing a limited number of pilot plant applications implementing the revised source term at operating reactors.

The NRC PRA Policy Statement calls for increased use of supportable PRA technology in a manner that complements the NRC's deterministic approach and supports the NRC's traditional defense-in-depth philosophy. This rulemaking proposes changes in the assumptions which may
be used voluntarily by operating reactor licensees in performing traditional deterministic, defense-in-depth safety analyses required by the Commission's regulations. Although this rulemaking is not risk-based, it is risk-informed in that the revised source term was developed

using risk insights from the severe accident research effort.

The staff requirements memorandum dated February 12, 1997, directed the NRC staff to develop this Rulemaking Plan and to incorporate TEDE and the maximum two-hour exclusion area boundary (EAB) accident TEDE guidelines into the proposed rulemaking. Since the existing accident dose guidelines are established in §100.11 and Part 50, Appendix A, GDC-19, changes will have to be made in Part 50 and possibly Part 100 will have to be changed to permit use of the revised source term. However, there are alternatives on how these changes and the supporting conforming changes can be implemented.

1. The following options were considered for accomplishing the needed rule changes:

    a. Incorporate accident TEDE guidelines in §100.11 and incorporate the TEDE criterion in GDC-19.

    b. Incorporate accident TEDE guidelines and the TEDE criterion in a new section to Part 50.

2. The following options were considered for providing regulatory guidance to support the rule changes:

    a. Publish no regulatory guidance.

    b. Publish guidance for use of revised source term in Regulatory Guides 1.3, 1.4, 1.25, 1.77, and 1.89 in a manner that retains current guidance for operating power reactors that do not implement the revised source term.

    c. Publish guidance for use of the revised source term in a new regulatory guide. This guide would also include applicable guidance from Regulatory Guides 1.3, 1.4, 1.25, 1.77, and 1.89, and from the Standard Review Plan (NUREG-0800), updated for consistency with the revised source term. Guidance in this new guide would supersede guidance from those documents for operating power reactors that do implement the revised source term.

On the basis of considerations discussed in the Rulemaking Plan (Attachment 1), the NRC staff believes that Options 1b and 2c define the preferred approach.

The NRC staff considered implementing the Part 52 conforming changes without revising Part 50, Appendix A, GDC-19, due to a perceived reluctance towards amending the general design criteria. However, no policy or technical basis was identified for not implementing the Part 52 conforming change by revising GDC-19.

The NRC staff has concluded that the application of the revised source term should be implemented through a license amendment. Once the revised source term is part of the facility's design basis, subsequent modifications involving analyses based on the revised source term, would be processed as provided for in §50.59 and §§50.90–50.92.

The proposed rulemaking would involve the following:

- Section 50.95 will be added to Part 50, to provide requirements for the implementation of the revised source term. This new section will contain accident dose guidelines expressed in terms of TEDE and the worst two-hour dose for the exclusion area boundary and will also contain a control room dose criterion expressed in terms of TEDE.

- Revise Part 50, Appendix A, GDC-19 to include a control room dose criterion expressed in terms of TEDE for new applicants under Part 50 and Part 52. The current dose criterion will be retained for those operating power reactors that opt not to implement the revised source term.

- Revise affected paragraphs in §50.34(f) to conform with Part 52.

- Revise affected paragraphs in §21.3 and §50.49 to conform with relocation of dose criteria to §50.95.

- Issue a new regulatory guide on the implementation of the revised source term, providing guidance on meeting the requirements that appear in the new section added to Part 50. Include, in a series of appendices, revised assumptions and methods for each design basis accident.

Insights from rebaseling show that significant increases in plant risk are unlikely due to design changes based on the revised source term. However, the NRC staff will consider whether the rulemaking needs to address changes based on the revised source term that result in an unacceptable increase in risk. The NRC staff concluded that any implementation of the revised source term requiring detailed dose calculations should address all applicable aspects of the revised source term. Nonetheless, some applications based only on the timing insights of the revised source term may be acceptable without detailed dose calculations. The NRC staff will consider how selective or limited implementation of the revised source term will be addressed in the rulemaking.

RESOURCES:

Resources to develop and implement this rulemaking are budgeted at a total of less than 2 FTE (1.5 FTE from NRR and 0.16 FTE from other offices).

AGREEMENT STATE IMPLEMENTATION ISSUES:

No Agreement State implementation problems are expected because the proposed rulemaking affects only the licensing and operation of nuclear power plants that are regulated by the NRC under Part 50, “Domestic Licensing of Production and Utilization Facilities.”

COORDINATION:

The Office of the General Counsel has no legal objections to the Rulemaking Plan. The Office of the Chief Financial Officer has reviewed this Commission Paper for resource implications and has no objection. The Office of the Chief Information Officer has reviewed the Rulemaking Plan for information technology and information management implications and concurs in it. However, the plan suggests changes in information collection requirements that must be submitted to the Office of Management and Budget at the same time the rule is forwarded to the Federal Register for publication. The NRC staff does not intend to coordinate this Rulemaking Plan with the Agreement States since this rulemaking is only applicable to licensees regulated by the NRC in accordance with Part 50. Copies have also been forwarded to ACRS and the OIG for information.

RECOMMENDATION:

I intend to proceed with the development of the rulemaking described in the attached Rulemaking Plan unless otherwise directed by the Commission within 10 days from the date of this paper.

L. Joseph Callan
Executive Director
For Operations

Attachment: Rulemaking Plan
10 CFR Parts 21 and 50

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Attachment: Rulemaking Plan
10 CFR Parts 21 and 50 (WITS 9700025)

DOCUMENT NAME: G:\sfl\rlplnltr2.wpd & G:\sfl\rulepln5.wpd *SEE PREVIOUS CONCURRENCE

OFC	PERB	E	SC:PERB	E	BC:PERB	E	Tech Editor		(A)D:DRPM		D:NRR	
NAME	SLaVie		REmch		CMiller		RSanders*		JRoe*		SCollins*	
DATE	6/30/98		6/30/98		6/30/98		6/25/98		6 /24/98		6/26/98	

OFC	D:RES		OGC		OE		OCFO		OCIO		OEDO	
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DATE	6 /23/98		6 / 25/98		6/25/98		6/25/98		6 /24/98		6/26/98	

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RULEMAKING PLAN
10 CFR PARTS 21 AND 50

IMPLEMENTATION OF REVISED SOURCE TERM AT CURRENTLY LICENSED LIGHT-WATER POWER REACTORS

REGULATORY ISSUE

Should the Nuclear Regulatory Commission (NRC)

1. Allow the use of revised source terms, such as those in NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants," at currently licensed light-water power reactors as a change to the facility design basis?

2. Revise §50.34(f) and Part 50, Appendix A, GDC-19, to eliminate the need for exemptions to these sections for future applicants under Part 50 and Part 52?

BACKGROUND

A holder of an operating license (licensee) for a light-water power reactor was required by regulations issued by the NRC (or its predecessor, the U.S. Atomic Energy Commission) to submit a safety analysis report in support of the license application that included assessments of the radiological consequences of potential accidents and an evaluation of the proposed facility site. The NRC staff used this information in its evaluation of the suitability of the reactor design and the proposed site as required by its regulations contained in 10 CFR Parts 50[1] and 100[2]. Section 100.11 requires an applicant to assume (1) a fission product release from the core, (2) the expected containment leak rate, and (3) the site meteorological conditions to establish an exclusion area and a low population zone. A footnote to §100.11 provides guidance that the fission product release be based on a credible major accident that would result in substantial release of appreciable quantities of fission products from the core to the containment atmosphere. A note to §100.11 references Technical Information Document (TID) 14844, "Calculation of Distance Factors for Power and Test Reactors,"[3] published in 1962 by the U.S. Atomic Energy Commission, as a source of guidance and as a point of departure for addressing site-specific considerations.

The accident source term is used to evaluate the radiological consequences of design basis accidents (DBAs) to determine compliance with various requirements in 10 CFR Parts 50 and 100. Although originally used for site suitability analyses, the accident source term is a design parameter for accident mitigation features, equipment qualification, control room operator radiation doses, and post-accident vital area access doses. The TID-14844 source term was explicitly stated as a required design parameter for several TMI-related requirements. The NRC staff considers the accident source term to be an integral part of the design basis since it was a significant input to a large portion of the plant design. TID-14844 postulated the release of 100% of the noble gases, 50% of the iodines, and 1% of the solids in the core fission product inventory, and further assumed that 50% of the radioiodines released to the containment would plate out onto internal surfaces of the reactor building or adhere to internal components. The 1% solids postulated in TID-14844 were not included in analyses of the consequences of accident releases to the environment, but are considered in other design basis evaluations, e.g., equipment qualification.

The NRC staff's methods for calculating accident doses, as described in Regulatory Guides 1.3[4] and 1.4[5] and in the Standard Review Plan[6], were developed to be consistent with the TID-14844 source term and the whole body and thyroid dose guidelines stated in §100.11. In this regulatory framework, the source term is assumed to be released immediately to the containment at the start of the postulated accident. The chemical form of

the radioiodine released to the containment atmosphere is assumed to be predominantly elemental, with small fractions of particulate and organic iodine forms. Radiation doses are calculated at the exclusion area boundary (EAB) for the first two hours and at the low population zone (LPZ) for the assumed 30-day duration of the accident. The whole body dose comes primarily from the noble gases in the source term, and the thyroid dose is based on inhalation of radioiodines. In analyses performed to date, the thyroid dose has generally been limiting, and the design of some engineered safety features, such as containment spray systems and containment, ventilation exhaust, and control room charcoal filters, are predicated on these postulated thyroid doses. This regulatory framework has provided a consistent analytical approach for evaluating the spectrum of potential consequences from DBAs.

Since the publication of TID-14844, significant advances have been made in understanding the timing, magnitude, and chemical form of fission product releases from severe nuclear power plant accidents. Many of these insights developed out of the major research effort started by the NRC and the industry after the accident at Three Mile Island (TMI). In 1995, the NRC published NUREG-1465[7], which utilized this research to provide more physically based estimates of the accident source term that could be applied to the design of future light-water power reactors. In NUREG-1465, the NRC staff presents a representative accident source term for a boiling-water reactor (BWR) and for a pressurized-water reactor (PWR). These source terms are described in terms of radionuclide composition and magnitude, physical and chemical form, and timing of release. Where TID-14844 addressed three categories of radionuclides, the revised source terms categorize the accident release into eight groups by physical and chemical properties. Where TID-14844 assumed an immediate release of the activity, the revised source term has five release phases that are postulated to occur over several hours, with the onset of major core damage occurring after 30 minutes. Where TID-14844 assumed radioiodine to be predominantly elemental, the revised source term assumes radioiodine to be predominantly cesium iodide (CsI), an aerosol that is more amenable to mitigation mechanisms. For DBAs, the NUREG-1465 source term is comparable to the TID-14844 source term with regard to the magnitude of the noble gas and radioiodine release fractions. However, the revised source term provides a more representative description of the radionuclide composition and release timing. In SECY-94-302, “Source Term-Related Technical and Licensing Issues Pertaining to Evolutionary and Passive Light-Water-Reactor Designs,”[8] the NRC staff determined that the first three phases (coolant, gap, and early in-vessel) are appropriate for design basis evaluations. The staff has concluded that these three phases will be applicable to design basis evaluations for operating reactors using the revised source term.

In Part 50, Appendix A, GDC-19[9], the NRC staff presents radiation dose criteria that are used to assess the suitability of the plant design with regard to maintaining control room habitability during DBAs. In §100.11, the NRC staff presents radiation dose guidelines that are used to assess the suitability of the plant design with regard to offsite exposures during design basis events. In the period since these regulations were issued, there have been significant developments in the principles and scientific knowledge underlying standards for systems of radiation dose limitation and assessment. These developments include not only updated scientific information on radionuclide uptake and metabolism, but also reflect changes in the basic philosophy of radiation protection. In 1991, the NRC staff revised 10 CFR 20, “Standards for Protection Against Radiation,”[10] to reflect these developments. The accident dose guidelines in §100.11 and Part 50, Appendix A, GDC-19, were not changed at that time as the requisite revision to the licensing basis of each operating power reactor was not deemed to be warranted. The standards in Part 20 include the dose quantity, “total effective dose equivalent” (TEDE), which is defined as the deep dose equivalent (for external exposure) plus the committed effective dose equivalent (for internal exposure). The deep dose equivalent (DDE) is comparable to the present whole body dose; the committed effective dose equivalent (CEDE) is the sum of the products of doses (integrated over a 50-year period) to selected body organs resulting from the intake of radioactive material multiplied by weighting factors for each organ that are representative of the radiation risk

associated with the particular organ. The TEDE, using a risk-consistent methodology, assesses the impact of all relevant nuclides upon all body organs. The revised source term requires the evaluation of "other" radionuclides but may reduce the amount of radioiodine available for release to the environment, potentially increasing the significance of the dose to organs other than the thyroid. The NRC staff recommended in SECY-96-242[11] that dose guidelines expressed in terms of TEDE be required if a licensee elects to use the revised source term. In a staff requirements memorandum dated February 12, 1997, the Commission directed the NRC staff to incorporate TEDE in this rulemaking.

The dose guideline for the EAB in §100.11 is specified with a two-hour exposure period commencing immediately following the onset of the fission product release. This exposure period was predicated, in part, on the traditional source term assumption that the activity would be immediately available for release at the onset of the accident. The combination of these two assumptions resulted in the maximum postulated dose. The revised source term postulates a release that occurs in phases, with the significant release starting after about 30 minutes and continuing for about 90 minutes (through the early in-vessel phase only). Because of this, an exposure period starting at the onset of the fission product release may not represent the limiting case. The NRC staff recommended in SECY-96-242 that dose guidelines expressed in terms of the worst two-hour dose be considered if a licensee elects to use the revised source term. In a staff requirements memorandum dated February 12, 1997, the Commission directed the NRC staff to incorporate the worst two-hour dose in this rulemaking.

The industry has expressed interest in using revised source term insights for DBA evaluations in support of plant technical specification and procedure modifications at a number of operating nuclear power plants. The NRC encouraged the industry to approach the issue on a generic basis to make efficient use of staff resources. The Nuclear Energy Institute (NEI) and Electric Power Research Institute (EPRI) have collaborated in developing a generic, technical framework for applying revised source term insights to operating nuclear plants. The results of this effort were submitted in November 1995 in TR-105909, "Generic Framework for Application of Revised Accident Source Term to Operating Plants."[12] This document presented four principles and contained appendices addressing comparisons between existing and revised source terms and information on aerosol releases. The industry proposed pilot projects to provide the NRC staff with a better understanding of how the generic framework would be implemented on a plant-specific basis. Several pilot projects have been docketed. In a letter to NEI, dated February 26, 1997, the NRC staff concluded that the four principles were generally acceptable with limitations related to aspects of selective implementation and dose calculational methodology. The staff deferred consideration of the appendices to the pilot project reviews.

As part of its efforts, the NRC staff has conducted a rebaselining evaluation of two PWRs and a BWR to gain insights into the possible scope of impacts of implementing the revised source term. The proposed rulemaking incorporates these insights. The NRC staff is reviewing the pilot plant applications, and will continue these reviews in concert with the preparation of the proposed rulemaking.

The NRC staff expects that future licensing applications in accordance with Part 52 will utilize the revised source term and accident TEDE guidelines. However, the AP600 proceeding identified that exemptions from §50.34(f)(vii), -(f)(viii), -(f)(xxvi), and -(f)(xxviii) and Part 50, Appendix A, GDC-19 were necessary. This rulemaking proposes conforming changes to eliminate the need for these exemptions for future applicants under Part 52. This rulemaking will not likely be completed in time to avoid the need for granting appropriate exemptions from Part 50 for the AP600 final design approval and design certification rulemaking.

To summarize, this rulemaking has the following objectives:

- Provide a regulatory framework for the voluntary implementation of the revised source term as a change to the design basis at currently licensed power reactors, thereby enabling potential cost-beneficial licensing actions while continuing to maintain existing safety margins and defense in depth.

- Retain the existing regulatory framework for currently licensed power reactors that do not implement the revised source term.

- Implement conforming changes to §50.34(f) and Part 50, Appendix A, GDC-19 to eliminate the need for exemptions for future applicants under Part 52.

EXISTING REGULATORY FRAMEWORK

The proposed rulemaking for implementation of the revised source term is applicable only to those facilities for which a construction permit was issued before January 10, 1997, under 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." The regulations of this part are supplemented by those in other parts of Chapter 1 of Title 10, including Part 100, "Reactor Site Criteria." Part 100 contains language that qualitatively defines a required accident source term and contains a note that discusses the availability of TID-14844. However, this note does not constitute a binding requirement on applicants. With the exception of §50.34(f), which addresses additional TMI-related requirements, there are no explicit requirements in Chapter 1 of Title 10 to use the TID-14844 accident source term. Section 50.34(f) is applicable only to a limited number of construction permit applications pending on February 16, 1982, and to applications under Part 52.

In SECY-94-300[13], the NRC staff concluded that the existing analytical approach based on the TID-14844 source term continues to be adequate to protect public health and safety, and that the staff did not intend to backfit the revised source term or the changes in dose guidelines on operating power reactors. In a paper to the Commission dated September 6, 1994[14], the NRC staff concluded that this rulemaking would not consider applications of the revised source term that seek relief from emergency planning requirements under §50.47.

Regulatory Guides 1.3 and 1.4 give the methods and assumptions acceptable to the NRC staff for assessing the consequences of DBA loss of coolant accidents (LOCAs) as required by §100.11. These regulatory guides provide guidance involving accident source terms, much of which is derived from TID-14844. Other guides specify accident source terms either directly or by reference to Regulatory Guides 1.3 and 1.4. None of these guides, however, explicitly refers to TID-14844. The Commission publishes regulatory guides to describe methods acceptable to the NRC staff for implementing specific parts of the Commission's regulations. Compliance with these guides is not required and applicants are allowed to propose alternatives for NRC staff consideration. Although NRC staff licensing reviews have been based on Regulatory Guides 1.3 and 1.4, the option for a licensee to propose alternatives has been, and remains as, a possible regulatory mechanism to implement a source term other than the one in TID-14844. Exemptions would be required in those cases where the applicable regulations specify the use of the TID-14844 source term.

An applicant for an operating license is required by §50.34 to submit a final safety analysis report (FSAR) that describes the facility and its design bases and limits, and that includes a safety analysis of the site and of the facility. Guidance in performing these analyses is provided in regulatory guides. In its review of the more recent applications for operating licenses, the NRC staff has used the review procedures in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (SRP). These review procedures reference or provide acceptable assumptions and analysis methods. Although compliance with the SRP is not required, in practice, many applicants adhere to the guidance in the interest of facilitating NRC staff review. Operating license applications docketed after May 17, 1982, are required in 50.34(g) to include an evaluation of the facility for conformance with the SRP. The facility FSAR documents the assumptions and methods actually used by the applicant in the required safety analyses. The NRC staff's finding that a license may be issued is based on the review of the FSAR, as documented in the staff's safety evaluation report (SER). By their inclusion in the FSAR, the assumptions (including source term) and licensee's methods of evaluation become part of the design basis of the facility.

Thus, from a regulatory standpoint, the requirement to use the TID-14844 source term is a licensee commitment (typically expressed as a commitment to Regulatory Guides 1.3 or 1.4) documented in the facility FSAR. The licensee may effect a change in its licensing basis, including the FSAR, by applying for an amendment of its license under §§50.90–50.92, or on its own volition within the provisions of §50.59. Because of the extensive use of the accident source term in the design and operation of a power reactor, and because of the potential impact on postulated accident consequences and margins of safety of a change of such a fundamental design assumption, the NRC staff has concluded that the revised source term must be implemented via a license amendment under §§50.90–50.92. Therefore, this rulemaking would add a new section, §50.95, to provide the requirements for implementing the revised source term. Industry initiatives that propose a particular modification for a group of licensees, i.e., an owner's group proposal, could be reviewed and accepted as a topical report (as is currently done). The accepted topical report could be referenced by individual licensees in their submittals under the proposed §50.95.

The revisions to 10 CFR Parts 50 and 100 for the consideration of new plant designs and new sites were developed to accommodate new source term and radiobiological insights. Included in that rulemaking were the requirements that radiation doses be expressed in terms of TEDE and that the EAB dose be the maximum value for any two-hour period following the onset of the fission product release. In a staff requirements memorandum dated February 12, 1997, the Commission directed that these requirements also be applicable to operating plants choosing to use the revised source term. Although the regulations do not specifically identify the TID-14844 source term, the dose guidelines for the EAB and LPZ for operating plants are presented in §100.11 and the design criteria for control room habitability are provided in Part 50, Appendix A, GDC-19. Therefore, the revised source term cannot be implemented without a revision to the accident dose

guidelines and the GDC-19 criteria. This Rulemaking Plan addresses these needed changes.

Part 52 governs the issuance of early site permits, standard design certifications, and combined licenses for nuclear power facilities. Future plants are expected to be licensed under this part. Part 52 is used in conjunction with applicable requirements of Part 50. The TMI-related requirements in §50.34(f) were specifically incorporated by reference in §52.47(a)(ii). This incorporation by reference is necessary because §50.34(f) limits applicability to specifically identified facilities for which an application for a construction permit was pending on February 16, 1982. The NRC staff expects that future plants will use the revised source term in supporting safety analyses. Since §§50.34(f)(vii), -(f)(viii), -(f)(xxvi), and -(f)(xxviii) contain specific references to the TID-14844 source term, these sections need to be revised. The control room habitability criteria in Part 50, Appendix A, GDC-19 were incorporated by reference in §52.47(a)(i). This criterion is expressed in terms of whole body dose or its equivalent to any part of the body rather than in terms of TEDE. Exemptions from these requirements will be necessary for the AP600 final design approval and design certification. This rulemaking plan will address changes to these affected sections in order to avoid the need for exemptions for subsequent applicants under Part 52.

Regulatory Guides 1.3, 1.4, 1.25[15], 1.77[16], and 1.89[17] address, respectively, LOCA (BWR), LOCA (PWR), fuel handling accident (FHA), rod ejection accident (PWR, but cross-referenced by SRP for BWR rod drop accident (RDA)), and equipment qualification. All of these guides address, to some degree, source term assumptions for use in accident analyses performed in support of licensing activities. Similar guidance would need to be developed for use of the revised source term in these applications.

HOW THE REGULATORY PROBLEM WILL BE ADDRESSED BY RULEMAKING

The proposed rulemaking will make possible the use of the revised source term by (1) establishing accident dose guidelines expressed in terms of total effective dose equivalent (TEDE) and the worst two-hour exposure, (2) establish control room operator accident dose criteria, (3) make necessary conforming changes, and (4) provide guidance for accident analyses using the revised source term in a new regulatory guide. Changes will be made to §50.34 and Part 50, Appendix A, GDC-19 for conformance with Part 52.

RULEMAKING OPTIONS

In the staff requirements memorandum dated February 12, 1997, the Commission directed the NRC staff to develop this rulemaking plan and to incorporate TEDE and the worst two-hour EAB accident dose guidelines into the proposed rulemaking. Since the existing accident dose guidelines are established in §100.11 and Part 50, Appendix A, GDC-19, changes to Part 50 and possibly Part 100 will be necessary to implement the revised source term. However, there

are options on how these changes and the supporting conforming changes can be implemented.

1. The following options were considered for the needed rule changes:

   a. Incorporate accident TEDE guidelines in §100.11 and incorporate the TEDE criterion in GDC-19.

   b. Incorporate accident TEDE guidelines and the TEDE criterion in a new section to Part 50.

2. The following options were considered for providing regulatory guidance to support the rule changes:

   a. Publish no regulatory guidance.

   b. Publish guidance for use of the revised source term in Regulatory Guides 1.3, 1.4, 1.25, 1.77, and 1.89, in a manner that retains current requirements for operating power reactors that do not implement the revised source term.

   c. Publish guidance for use of the revised source term in a new regulatory guide. This guide would also include applicable guidance from Regulatory Guides 1.3, 1.4, 1.25, 1.77, and 1.89, and from the Standard Review Plan (NUREG-0800), updated for consistency with the revised source term. Guidance in this new guide would supersede guidance from those documents for operating power reactors that do implement the revised source term.

Options for Rule Changes

Option 1a Incorporate accident TEDE guidelines in §100.11 and incorporate the TEDE criterion in GDC-19.

This option would provide the revised dose guidelines necessary to implement the revised source term by adding the accident TEDE guidelines to §100.11 in a manner that retains the existing whole body and thyroid dose guidelines for operating power reactors that do not opt to implement the revised source term. The TEDE criterion would similarly be added to GDC-19.

Advantages There are a large number of cross-references to §100.11 in regulatory guides and Standard Review Plan chapters, and within the design basis for operating power reactors. Placing the accident TEDE guidelines in §100.11 would minimize the number of necessary conforming changes.

Disadvantages Placing the accident TEDE guidelines into §100.11 would continue the implied linkage between plant siting and accident doses for operating power reactors. The logical structure necessary to separate requirements for plants that retain the TID-14844 source term from those that opted for the revised source term would add confusion to §100.11 and GDC-19.

Option 1b Incorporate accident TEDE guidelines in a new section in Part 50.

This option would place the accident TEDE guidelines necessary to implement the revised source term in a proposed §50.95 As discussed above, the existing accident dose guidelines are not suitable for use with the revised source term. This option would keep the existing dose guidelines in §100.11 and in GDC-19 for those

operating power reactors that do not opt to implement the revised source term.

Advantages — Placing the accident TEDE guideline in a new section to Part 50 would be consistent with the most recent change to Part 100 for future reactor licensing. (That change addressed non-radiological siting concerns for future reactors in a new Subpart B to Part 100 and placed accident dose guidelines for these reactors in §50.34. Accident dose guidelines for operating power reactors remained in §100.11.) This approach would also group all requirements associated with the revised source term in a single section, improving the overall clarity of the rule. The need to add definitions of TEDE, committed dose equivalent, and committed effective dose equivalent to Part 100 would be eliminated, since these are already defined in §50.2.

Disadvantages — Providing accident TEDE guidelines in a new section in Part 50 rather than in §100.11 would increase the number of conforming changes. There are a number of cross-references to §100.11 in regulatory guides, Standard Review Plan chapters, and within the design basis for operating power reactors.

Options for Providing Implementation Guidance

Option 2a — Publish no regulatory guidance.

This option would make the necessary rulemaking for accident TEDE guidelines as described in Options 1a and 1b above, but would not provide any additional regulatory provisions or guidance related to the use of the revised source term. Licensees could pursue implementation of the revised source term in cost-beneficial licensing actions in accordance with §§50.90– 50.92, or by means of §50.59, incorporating analysis methodologies and assumptions deemed appropriate by the licensee.

Advantages — No NRC staff resources would be needed to develop additional guidance. Option 2a would be less prescriptive than other options.

Disadvantages — In the absence of clear requirements and generic guidance, extensive NRC staff resources would be needed on a continuing basis to review the acceptability of licensee proposals. Extensive NRC staff and applicant resources would likely be required to resolve differences in technical positions, thus adding to costs. Without clear guidance, some licensees may improperly conclude that according to §50.59, the revised source term could be implemented without NRC staff review. Regulatory stability could be diminished.

Option 2b — Publish guidance for use of the revised source term in Regulatory Guides 1.3, 1.4, 1.25, 1.77, and 1.89 in a manner that retains current guidance for operating power reactors that do not implement the revised source term.

This option would provide guidance for the use of the revised source term by revising the regulatory guides that address acceptable assumptions for DBAs that involve fuel damage or provide source terms for environmental qualification. Regulatory Guides 1.3, 1.4, 1.25, 1.77, and 1.89 address, respectively, LOCA (BWR), LOCA (PWR), fuel handling accident (FHA), rod ejection accident (PWR, but cross-referenced by SRP for BWR rod drop accident (RDA)), and equipment qualification. These guides would be revised in such a manner that they remain applicable to those operating power reactors that do not pursue use of the revised

source term.

Advantages — Guidance would be provided to facilitate preparation and NRC staff review of licensee submittals. There would continue to be one regulatory guide for each accident, a situation familar to operating reactor licensees.

Disadvantages — Since the regulatory guides will continue to be applicable to operating power reactors that do not implement the revised source term, the required changes would be additions to the existing text. Some of this added text would be repeated in each guide. This could add confusion to the structure and clarity of the guides.

Option 2c — Publish guidance for use of revised source terms in a new regulatory guide applicable only to those operating power reactors implementing the revised source terms; include updated guidance from Regulatory Guides 1.3, 1.4, 1.25, 1.77, and 1.89 and from the Standard Review Plan.

This option would provide guidance for the use of the revised source terms by issuing a new regulatory guide on the implementation of the revised source terms and which would include, in a series of appendices, revised assumptions and methods for each DBA.

Advantages — Guidance would be provided to facilitate preparation and NRC staff review of licensee submittals. A single regulatory guide that addresses the implementation of the revised source term would localize this information, maintain clear separation of assumptions and methods applicable to operating power reactors using either the TID-14844 or the revised source term, and would reduce the number of conforming changes to regulatory guides and SRP chapters. NRC staff resources for preparing this regulatory guide would be less than that for Option 2b.

Disadvantages — This option would result in a regulatory guide that would address several different accident sequences in a single guide rather than having a single guide for each accident sequence as is now the case.

ALTERNATIVES TO RULEMAKING

In the staff requirements memorandum dated February 12, 1997, the Commission directed the NRC staff to develop this rulemaking plan and to incorporate TEDE and the worst two-hour

EAB accident dose guidelines into the proposed rulemaking. Therefore, no alternatives to rulemaking were considered.

RECOMMENDED APPROACH

On the basis of the considerations discussed above, the NRC staff believes that Rulemaking Options 1b and 2c define the preferred approach. The proposed rulemaking would allow operating power reactors to implement the revised source term through a change to the design basis, on a voluntary basis. This approach would:

- Add §50.95, a new section, to provide requirements for the voluntary implementation of the revised source term. This section will contain accident dose guidelines expressed in terms of TEDE and the worst two-hour dose for the EAB, and will include a control room dose criterion expressed in terms of TEDE.

- Revise affected paragraphs in §50.34(f) to permit Part 52 applicants to use the revised source term, thereby avoiding the need for exemptions.

- Revise Part 50, Appendix A, GDC-19 to include a control room dose criterion expressed in terms of TEDE for new applicants under Part 50 and Part 52. The current dose criterion will be retained for those operating power reactors that opt not to implement the revised source term.

- Revise affected paragraphs in §21.3 and §50.49 to conform with relocation of dose criteria to §50.95, a new section.

- Issue a new regulatory guide on the implementation of the revised source term, presenting guidance on meeting the requirements in the new section added to Part 50. Include, in a series of appendices, revised assumptions and methods for each design basis accident.

Rulemaking Options 1a, 2a, and 2b are not preferred options. Option 1b is preferred over Option 1a because of the clearer structure that will result from co-locating relevant requirements. Similarly, Option 2c is preferred over Option 2b. Option 2a is not deemed applicable since guidance on the implementation of the revised source is considered to be needed to ensure consistency and minimize unproductive efforts on the part of licensees in preparing submittals that may reflect different methods and assumptions, and on the part of NRC staff in reviewing those submittals.

Insights from rebaseling show that significant increases in plant risk are unlikely due to design changes based on the revised source term. However, the NRC staff will consider whether the rulemaking needs to address changes based on the revised source term that result in an unacceptable increase in risk. The NRC staff concluded that any implementation of the revised source term requiring detailed dose calculations should address all applicable aspects of the revised source term. Nonetheless, some applications based only on the timing insights of the revised source term may be acceptable without detailed dose calculations. The NRC staff will consider how selective or limited implementation of the revised source term will be addressed in the rulemaking.

IMPACT ON LICENSEES

Costs and Benefits of Rulemaking Options

As discussed earlier, the NRC staff has determined that the existing licensing basis source term provides adequate protection of the public, and that operating power reactors would not be required to implement the revised source term. By this rulemaking, the NRC staff will allow operating power reactors to voluntarily revise their design bases to incorporate the revised source term pursuant to the requirements and guidance presented in the proposed rulemaking. It is expected that operating power reactors will elect to make these changes to their design basis only if it is perceived to be to their benefit to change. This rulemaking would also make conforming changes to Part 50 to avoid the need for issuance of exemptions for future applicants under Part 52, including applicants for design certifications.

Since implementation of the revised source term is voluntary for operating power reactors, the NRC staff has not performed cost-benefit analyses. In 1996, NEI informally polled the industry to determine the uses and frequency that licensees might apply the revised source term. Although the poll was informal and does not constitute any commitment to act, the results of the poll provide an indication of the level of interest in the proposed rulemaking. The responses received represented 43 operating power reactors. Of these, 41 reactors plan to use the revised source term to pursue plant modifications. Anticipated applications of the revised source term included the following:

- change in allowable leak rate (24 plants)
- change in isolation valve actuation timing (31 plants)
- simplification of filtration units (27 plants)
- change in mitigation system actuation timing (22 plants)
- change in equipment qualification (2 plants)

There is an expectation that many of the revised source term applications may provide concomitant improvements in overall safety and in reduced occupational exposure, as well as economic benefits. Due to the wide range of possible applications and the voluntary nature of this rulemaking it is not reasonable to quantify possible outcomes. Reductions in occupational exposures may be realized through reductions in maintenance efforts associated with maintaining unnecessarily limiting leakage, timing, or filtration requirements. Improvements in overall safety may be realized through reduced emergency diesel generator loading, improved containment ventilation system performance due to lessened filter flow resistance, and closer synchronization of mitigation feature actuation with the onset of major fission product release, to provide three examples. There may be improvements in safety margins realized due to the upgrading of analysis assumptions, methods, and acceptance criteria. It is believed that the proposed rulemaking will result in an improvement in the allocation of resources both for the NRC and for industry. The industry will be allowed to propose applications of the revised source term that could reduce unnecessary or ineffective requirements in the facility design basis. The NRC and the industry stand to gain from having appropriate regulatory requirements and guidance needed to facilitate preparation and NRC staff review of licensee submittals. Limited resources could be diverted to safety issues of greater significance.

Consequences of Proposed Rulemaking

The implementation of the revised source term at an operating power reactor would replace the traditional

TID-14844 source term with a source term that is based on the insights from extensive accident research activities. The actual accident sequence and progression is not changed; it is the regulatory assumptions regarding the accident that will be affected by substituting the revised source term. Use of the revised source term alone cannot increase the core damage frequency (CDF) or the large early release frequency (LERF) or actual offsite or onsite radiation doses. (While *actual* doses would not increase, analysis results may show an increase in some *postulated* doses because additional radionuclides will be considered and dose modeling will be more comprehensive.) The revised source term is used in analyses performed to assess the adequacy of the plant design to contend with a DBA to ensure adequate defense in depth and adequate safety margins. The design basis assumptions for a LOCA are that core melt has occurred and that the containment is intact.

The revised source term could be used to justify changes in the plant design that could have an impact on CDF or LERF. The proposed regulatory guide will discuss the need for an evaluation of the impacts of the revised source term implementation, including consideration of reductions in defense in depth, safety margins, or both. Consistent with Regulatory Guide 1.174, "An
Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Current Licensing Basis," the proposed regulatory guide will indicate that consideration of PRA insights may be necessary if the proposed changes to the design basis are not addressed in currently approved NRC staff positions.

On the basis of these considerations, the NRC staff does not believe that the proposed rulemaking will involve a significant increase in the probability or consequences of accidents previously analyzed, nor will it create a new or different type of accident or result in a significant reduction in safety margins.

Impacts on Agreement State Licensees

This rulemaking does not affect Agreement State licensees because the rulemaking affects only the licensing and operation of nuclear power plants that are regulated by the NRC under Part 50, “Domestic Licensing of Production and Utilization Facilities.” This rulemaking, therefore, would not place any additional regulatory burden on Agreement State licensees.

OFFICE OF GENERAL COUNSEL LEGAL ANALYSIS

The Office of General Counsel (OGC) has reviewed the rulemaking plan and the suggested rule language. As we understand it, the proposed rule would provide an alternative to existing holders of operating licenses to utilize the revised source terms and the TEDE dose criterion. The proposed rule would also make conforming changes to Section 50.34(f) by removing the references to TID-14844, and to GDC-19 to provide TEDE criteria, in order to avoid the need to issue exemptions from Part 50 for future applicants under Part 52 (this rulemaking will not likely be completed in time to avoid the need to grant appropriate exemptions from Part 50 for the AP600 final design approval (FDA) and design certification rulemaking). These conforming changes would also provide an alternative for the very small class of plants listed under Section 50.34(f) to use either the TID-14844 source terms and current dose criteria or the revised

source terms and TEDE dose criterion, should the construction permit holders for the listed plants decide to reactivate their applications.

We agree with the Staff's assessment that, since the proposed rule sets forth an alternative to current requirements, the proposed rule would not constitute a backfit. As the Staff recognizes, an environmental assessment and regulatory analysis will be needed for the proposed rule. In addition, the Staff will have to determine whether the proposed rule will require OMB clearance under the Paperwork Reduction Act and whether the proposed rule constitutes a "major rule" for purposes of the Small Business Regulatory Enforcement Fairness Act, thereby requiring a waiting period for Congressional review. Finally, it appears that there are no relevant industry consensus standards extant which would require NRC consideration under the National Technology Transfer and Advancement Act of 1995.

OGC has not identified any legal impediment to the proposed rulemaking, but we anticipate that the suggested rule language will require refinement and supplementation prior to its publication in the Federal Register as a proposed rule for public comment.

CATEGORY OF RULE

This rulemaking will allow operating reactors to voluntarily pursue CBLAs made possible by the revised source term. These CBLAs are expected to offer desirable concomitant outcomes, such as improvement in safety margins, reduction in personnel occupational exposure, or both.

This rulemaking affects only the licensing and operation of nuclear power plants. The companies that own these plants do not fall within the scope of the definition of "small entities" stated in the Regulatory Flexibility Act (RFA) or the size standard adopted by the NRC in accordance with §2.810.

This rulemaking is not a "major rule" as defined in the RFA, since it is not expected to have an annual effect on the economy in excess of $100 million. Since the rulemaking involves establishing alternate requirements that may be voluntarily adopted by licensees, there can be no major increase in costs or prices for any person or entity, or significant adverse effects on competition, employment, or other similar aspects identified in the RFA.

BACKFIT ANALYSIS

The rulemaking proposed in this plan amends a current regulation and amends current regulatory guidance by establishing alternate requirements that may be voluntarily adopted by licensees. Therefore, the rulemaking does not constitute a backfit as defined in §50.109(a)(1), and a backfit analysis is not necessary.

SUPPORTING DOCUMENTS NEEDED

A new regulatory guide entitled "Revised Radiological Source Term for Evaluating the Radiological Consequences of Design Basis Accidents at Boiling and Pressurized Water Reactors," will be prepared to support this rulemaking. This regulatory guide is planned to provide generic guidance on revising the design basis at operating reactors to reflect the revised source term. Appendices to this draft guide will tabulate those assumptions, methods, and acceptance criteria acceptable to the NRC staff for performing radiological consequence calculations for accident events for which the revised source term would be applicable. This regulatory guide will, for operating power reactors adopting the revised source term, supersede current radiological analysis guidance in Regulatory Guides 1.3, 1.4, 1.25, 1.77 and 1.89, and applicable SRPs.

Those documents would remain in place to support the licensing basis for those operating power reactors that chose not to adopt the revised source term. The guidance in the regulatory guide is expected to override conflicting review procedures in the Standard Review Plan. Although changes to affected SRP chapters would be advantageous over the longer term, these changes can be implemented within the scope of the ongoing SRP updating project.

A regulatory impact analysis, an OMB package and an environmental assessment will be prepared for this rulemaking.

As discussed above, the NRC staff expects to review several pilot projects of the revised source term at operating power reactors in conjunction with the development of this rulemaking. These pilot projects will be processed in accordance with existing license amendment procedures in §§50.90–50.92. Several of these pilot projects have been docketed. In the staff requirements memorandum dated February 12, 1997, the Commission concurred with the NRC staff's recommendation that dose calculations expressed in terms of TEDE would be required in applications of the revised source term. Since the current dose criteria in §100.11 and GDC-19 do not provide for use of TEDE, the proposed pilot plant amendments would not comply with existing regulations. The NRC staff considered delaying the pilot plant reviews until the affected sections of Title 10 could be revised. This approach would have denied the NRC staff the benefit of the insights to be drawn from reviewing the pilot projects in preparing the rulemaking. Pilot plant licensees have invested substantial resources in their submittals, and experience has demonstrated that evaluation of a limited number of plant-specific submittals improves regulatory guidance and rule revisions. The NRC staff recommended, and the Commission concurred, that the pilot reviews should be performed concurrent with the rulemaking and that specific exemptions to §100.11 and GDC-19 could be granted to the limited number of pilot plants.

ISSUANCE BY EXECUTIVE DIRECTOR FOR OPERATIONS OR COMMISSION

The NRC staff is recommending that the Commission issue this rulemaking because it involves a significant policy issue.

INTEROFFICE MANAGEMENT STEERING GROUP

Not needed for this rulemaking. This rulemaking does not involve the complexity, nor is it likely to involve the controversy, that would require a management steering group.

PUBLIC/INDUSTRY PARTICIPATION

Significant public interest is not anticipated. The rulemaking documents will be placed on the NRC's home page (rulemaking) in addition to publication in the Federal Register. By letter dated July 27, 1994, the NRC staff invited the Nuclear Energy Institute (NEI) to serve as a focal point for discussions with the nuclear industry. The industry and the NRC staff have met several times. In November 1995, NEI submitted a generic framework for applying source term insights to operating power reactors. The NRC staff commented on this framework in February 1997. The NRC staff expects to participate in noticed meetings with NEI and members of its source term task force as the rulemaking proceeds.

RESOURCES

The following staff are expected to participate in the development of this rulemaking:

Office	Staff Level Working Group	Concurring Official
NRR	Barry Zalcman* Richard L. Emch, Jr. Stephen F. LaVie	Samuel J. Collins
RES	Jason H. Schaperow	Bill M. Morris
OGC	Geary S. Mizuno	Karen D. Cyr
OE	Nader L. Mamish	James Lieberman

*Project Manager

The following FTEs are estimated to be needed to complete the proposed rulemaking:

- 1.5 FTE to develop proposed and final rule and regulatory guide
- 0.16 FTE for other offices to provide technical input, review

SCHEDULE

Proposed rule package (including regulatory guide) to EDO	7/30/99
Final rule package to EDO	2/28/00

The OMB clearance package will be submitted to OMB at the same time as the proposed rule is published in the Federal Register.

Attachment A

SUGGESTED RULE LANGUAGE

The suggested rule language is provided in this section. This preliminary proposed rule language and the content of the proposed regulatory guide may need to be revised to reflect the insights obtained as the NRC staff reviews the submitted pilot plant applications.

1. Section 21.3 is amended by revising paragraph (1)(I)(C) of the definition of *Basic Component* to read as stated below. This change is necessary to conform with the relocation of accident dose guidelines from §100.11 to §50.95, a new section, for operating reactors that have amended their design basis to incorporate the revised source term.

> §21.3. Definitions.
>
> * * * * *
>
> *Basic Component.*
>
> (1) * * *
>
> (I) * * *
>
> (C) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in §50.34(a)(1), §50.95(b)(2), or §100.11 of this chapter, as applicable.

2. Section 50.34 is amended by revising paragraphs (f)(vii), (f)(viii), (f)(xxvi), and (f)(xxviii), and adding new footnote 11 to read as stated below. These changes remove the specific reference to TID-14844. This change affects only two classes of applicants. The first affected class is facilities licensing under Part 52 (which incorporates §50.34(f) by reference pursuant to §52.47(a)(ii)). This change is needed to conform with Part 52 and to eliminate the need for an exemption for future applicants under Part 52. The second affected class is the small subset of plants that had construction permits pending as of February 16, 1982. With the proposed change, this latter class could use either the TID-14844 source term or the revised source term in its operating license application.

> §50.34 Contents of applications; technical information
>
> * * * * *
>
> (f) * * *
>
> (2) * * *
>
> (vii) Perform radiation and shielding design reviews of spaces around systems that may, as a result of an accident, contain ~~TID14844~~ accident source term(11) radioactive materials, and design as necessary to permit adequate access to important areas and to protect safety equipment from the radiation environment. (II.B.2)
>
> (viii) Provide a capability to promptly obtain and analyze samples from the reactor coolant system and containment that may contain ~~TID14844~~ accident source term(11) radioactive materials without radiation exposures to any individual exceeding 5 rems to the whole body or 50 rems to the extremities.

Materials to be analyzed and quantified include certain radionuclides that are indicators of the degree of core damage (e.g., noble gases, radioiodines and cesiums, and nonvolatile isotopes), hydrogen in the containment atmosphere, dissolved gases, chloride, and boron concentrations. (II.B.3)

(xxvi) Provide for leakage control and detection in the design of systems outside containment that contain (or might contain) ~~TID14844~~ accident source term[(11)] radioactive materials following an accident. Applicants shall submit a leakage control program, including an initial test program, a schedule for re-testing these systems, and the actions to be taken for minimizing leakage from such systems. The goal is to minimize potential exposures to workers and public, and to provide reasonable assurance that excessive leakage will not prevent the use of systems needed in an emergency. (III.D.1.1)

(xxviii) Evaluate potential pathways for radioactivity and radiation that may lead to control room habitability problems under accident conditions resulting in ~~a TID14844~~ an accident source term[(11)] release, and make necessary design provisions to preclude such problems. (III.D.3.4)

[11] The fission product release assumed for these calculations should be based upon a major accident, hypothesized for purposes of site analysis or postulated from considerations of possible accidental events, that would result in potential hazards not exceeded by those from any accident considered credible. Such accidents have generally been assumed to result in substantial meltdown of the core with subsequent release of appreciable quantities of fission products.

* * * * *

3. Section 50.49 is amended by revising paragraph (b)(1)(I)(C) to read as stated below. This change is necessary to conform with the relocation of accident dose guidelines from §100.11 to the new §50.95 for operating reactors that have amended their design basis to incorporate the revised source term.

§50.49 Environmental qualification of electric equipment important to safety for nuclear power plants.

* * * * *

(b) * * *

(1) * * *

(I) * * *

(C) The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guidelines in §50.34(a)(1), §50.95(b)(2), or §100.11 of this chapter, as applicable.

4. Part 50 is amended to add §50.95, a new section, to read as stated below. This section affects only that class of licensees that currently hold operating licenses and wishes to amend the facility design basis to use revised source terms in design basis accidents. Once the design basis change is approved, subsequent plant modifications would be processed under §50.59 or §§50.90–50.92, as applicable. This section provides the regulatory basis for using revised source terms, and establishes the TEDE dose guidelines and control room habitability requirements. Placing these criteria here rather than in §100.11 and GDC-19 avoids complex logic structures that would be necessary to avoid impacts on other classes of licensees. This section was numbered as §50.95 placing the text in the subpart identified as "Amendment of License or Construction Permit at Request of Holder." This is consistent with the NRC staff position that the use of the revised source term should be accomplished through an amendment to the licensing basis.

50.95 Revised Accident Source Term

(a) *Applicability.* The requirements of this section apply to all holders of operating licenses issued prior to January 10, 1997, who seek to amend the facility design basis to use revised source terms in design basis accident radiological analyses.

(b) *Definitions:* As used in this section, *source term* refers to the magnitude and mix of radionuclides released from the reactor core, their physical and chemical form, and the timing of their release.

(c) *Requirements:* A licensee may apply for a license amendment to use a revised accident source term in design basis accident radiological consequence analyses. The applicant shall perform an evaluation and analysis of the postulated fission product releases(1), using the containment leak rate and any fission product cleanup systems intended to mitigate the consequences of the accidents, together with applicable site characteristics, including site meteorology, to evaluate the radiological consequences. The evaluation must determine that:

(I) An individual located at any point on the boundary of the exclusion area for any 2 hour period following the onset of the postulated fission product release, would not receive a radiation dose in excess of 25 rem(2) total effective dose equivalent (TEDE).

(ii) An individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), would not receive a radiation dose in excess of 25 rem total effective dose equivalent (TEDE).

(iii) Adequate radiation protection is provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 5 rem total effective dose equivalent (TEDE) for the duration of the accident. The dose criteria of Part 50 Appendix A GDC-19 do not apply.

[1] The fission product release assumed for these calculations should be based upon a major accident, hypothesized for purposes of design analyses or postulated from considerations of possible accidental events, that would result in potential hazards not exceeded by those from any accident considered credible. Such accidents have generally been assumed to result in substantial meltdown of the core with subsequent release of appreciable quantities of fission products.

[2] The total effective dose equivalent (TEDE) of 25 rem referred to above is specified for use with revised source terms since it utilizes a risk-consistent methodology to assess the radiological impact of all relevant nuclides upon all body organs. The latent cancer risk of a radiation dose of 25 rem TEDE is consistent with the latent cancer risk associated with exposures of 25 rem to the whole body and 300 rem to the thyroid. Risk of latent cancer fatality is used as the risk measure since quantitative health objectives for it have been established in the Commission's Safety Goal Policy. However, the use of 25 rem TEDE in these accident dose guidelines is not intended to imply that this value constitutes an acceptable limit for emergency doses to the public under accident conditions. Rather, this 25 rem TEDE value has been stated in these guides as a reference value, which can be used in the evaluation of proposed design basis changes with respect to potential reactor accidents of exceedingly low probability of occurrence, and low risk of public exposure to radiation.

5. Part 50, Appendix A, General Design Criterion 19, is amended to read as stated below. This conforming change establishes dose criteria for future applicants under Part 52. The dose criteria for operating reactors using the revised source term is addressed in the proposed §50.95. Although Appendix A has a limited number of its own definitions, the TEDE definition cross reference was added since TEDE is already defined in §50.2.

Criterion 19 — Control room. A control room shall be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions, including loss-of-coolant accidents. Adequate radiation protection shall be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 5 rem whole body, or its equivalent to any part of the body, for the duration of the accident.

Equipment at appropriate locations outside the control room shall be provided (1) with a design capability for prompt hot shutdown of the reactor, including necessary instrumentation and controls to maintain the unit in a safe condition during hot shutdown, and (2) with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures.

Applicants for construction permits under this part, or a design certification or combined license under Part 52 of this chapter who apply on or after January 10, 1997, shall meet the requirements of this criterion, except that radiation exposures shall not exceed 5 rem total effective dose equivalent (TEDE) as defined in §50.2 of this chapter for the duration of the accident.

1. USNRC, “Domestic Licensing of Production and Utilization Facilities,” Title 10, Code of Federal Regulations, Part 50.

2. USNRC, “Reactor Site Criteria,” Title 10, Code of Federal Regulations, Part 100.

3. DiNunno, J.J., et al, “Calculation of Distance Factors for Power and Test Reactor Sites”, Technical Information Document 14844, USAEC, 1962

4. USNRC, “Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors”, Regulatory Guide 1.3, 1970

5. USNRC, “Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors”, Regulatory Guide 1.4, 1970

6. USNRC, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants”, NUREG-0800, 1981

7. Soffer, L., et al, “Accident Source Terms for Light Water Nuclear Power Plants”, NUREG-1465, USNRC, 1995

8. USNRC, “Source Term-Related Technical and Licensing Issues Pertaining to Evolutionary and Passive Light-Water-Reactor Designs,” SECY-94-302, December 19,1994

9. USNRC, “Control Room,” Title 10, Code of Federal Regulations, Part 50, Appendix A, General Design Criterion 19

10. USNRC, “Standards for Protection From Radiation,” Title 10, Code of Federal Regulations, Part 20

11. USNRC, “Use of the NUREG-1465 Source Term at Operating Reactors,” SECY-96-242, November 25, 1996

12. EPRI, “Generic Framework for Application of Revised Accident Source Term to Operating Plants,” TR-105909,1995

13. USNRC, “Proposed Issuance of Final NUREG-1465, ‘Accident Source Terms for Light-Water Nuclear Power Plants’”, SECY-94-300, December 15, 1994

14. USNRC, “Use of NUREG-1465 Source Term at Operating Reactors,” Commission paper dated September 6, 1994

15. USNRC, “Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors,” Regulatory Guide 1.25 (Safety Guide 25), 1972

16. USNRC, “Assumptions Used for Evaluating a Control Rod Ejection Accident for Pressurized Water Reactors,” Regulatory Guide 1.77,1974

17. USNRC, “Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants,” Regulatory Guide 1.89, 1984