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MEMORANDUM FOR: Robert E. Browning, Director
Division of High-Level Waste Management
Office of Nuclear Material Safety
and Safeguards

FROM: Ronald L. Ballard, Chief
Geosciences & Systems Performance Branch
Division of High-Level Waste Management
Office of Nuclear Material Safety
and Safeguards

SUBJECT: SCOPE OF ONGOING TECHNICAL POSITION

Enclosed is a scope developed by the Geosciences and Systems Performance Branch (HLGP) of an ongoing Technical Position (TP) dealing with the application of Appendix A of 10 CFR Part 100 (Appendix A) to the geologic repository. It was prepared using the Division's work plan on the development of TPs. The scheduled completion date is estimated to be August 31, 1989 and the resource impact to the Division will be approximately 0.7 FTE.

In accordance with the HLWM work plan, those parties receiving copies of this memorandum who are listed below are encouraged to provide recommendations on the need to continue development of this TP. All recommendations should be provided to the Director within ten work days of the date of this memorandum. If you require any additional assistance, please contact the HLGP staff member responsible for development of this TP, Michael Blackford at extension 20524.

Bl
Ronald L. Ballard, Chief
Geosciences & Systems Performance Branch
Division of High-Level Waste Management
Office of Nuclear Material Safety
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Enclosures:
As Stated

cc: G. Arlotto G. Bagchi
 J. Linehan J. Bunting
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88/11/

Approved, R. E. Browning

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**Scope for the Technical Position on
Methods of Evaluating the Earthquake Hazard
Present at a Geologic Repository**

1.0 Regulatory Evaluation

The need for this Technical Position (TP) arose because of concerns expressed by the Department of Energy (DOE) regarding methodologies or approaches for evaluating the earthquake hazard present at a geologic repository that are acceptable to the NRC staff and that, if used, could result in meeting the regulatory requirements of 10 CFR Part 60. In particular, the DOE raised questions regarding the applicability of Appendix A of 10 CFR Part 100 (Appendix A), and the Regulatory Guides (RG's) and Standard Review Plans (SRP's) stemming from this appendix, to the geologic hazard evaluation for a geologic repository.

Appendix A addresses the seismic and geologic siting criteria for nuclear power plants which have operational periods similar to the operational period of a geologic repository prior to permanent closure. This TP is primarily concerned with the earthquake hazard at a geologic repository prior to permanent closure, but because a geologic repository, by its very nature, is the final location of high-level radioactive waste (HLW), the earthquake hazard that is present following permanent closure will also be considered where common compliance demonstration methods exist.

There are several advantages to using positions already established by the NRC in Appendix A and its supporting RG's and SRP's. First, there are resource savings since it would not be necessary for the Division of High-Level Waste Management (HLWM) staff to develop these or similar positions independently. Secondly, the referenced guides and positions are useful because the methods and information they contain have been carefully reviewed by the NRC staff and found to be an appropriate means for meeting certain regulations. Finally, these guides have been successfully applied in many civilian power plant license applications.

The staff has considered the regulatory requirements of 10 CFR Part 60 that pertain to the geologic hazard, including the earthquake hazard, at a geologic repository. These requirements include the basic regulatory requirement, found in §60.131(b), that addresses the need for protection against natural phenomena such as earthquakes; the siting condition in §60.122(b)(1) that addresses the favorable conditions of tectonic processes; and the requirements derived from the potentially adverse conditions in paragraphs (3), (4), (11), (12), (13), and (14) of §60.122(c). These requirements have been compared to requirements expressed in other parts of 10 CFR that pertain to the geologic hazard at nuclear power plants. As a result of these considerations and comparisons, the

development of a draft TP for internal NRC review on this subject is nearing completion. The TP is also taking into account the regulatory activities (i.e. Program Architecture) currently under development by the Center for Nuclear Waste Regulatory Analyses (CNWRA).

2.0 Proposed Guidance Currently Under Development

"Introduction": The stated purpose of the internal NRC draft TP currently under development is, "to provide the U.S. Department of Energy (DOE) with guidance on appropriate compliance demonstration methods that address regulatory requirements concerning earthquake hazards present at a geologic repository." The introduction further states that the TP will address the applicability of Appendix A through an analysis of the elements of proof in 10 CFR Part 60 pertaining to earthquake hazards, the identification of applicable seismic and geologic criteria in Appendix A, and uncertainties and information that should be considered in evaluating geologic repository earthquake hazards.

"Regulatory Background": First cited are paragraphs in 10 CFR Part 60 having compliance demonstration requirements concerning earthquake hazards present at a geologic repository. These paragraphs either address earthquakes directly or consider earthquakes in the context of "natural phenomena". Next, the section identifies portions of Appendix A which should be considered in investigating and analyzing potentially adverse earthquake conditions. These excerpts include methods for investigating vibratory ground motion and surface faulting, methods for developing design bases for vibratory ground motion and surface faulting, and methods for applying these design bases.

"Position": The NRC staff presents the position that, "the methodologies prescribed in Appendix A of 10 CFR Part 100 for investigations of seismic and geologic phenomena, for the development of design bases derived from the effects of these phenomena, and for the application of the design bases, should be utilized as appropriate to address the regulatory requirements of 10 CFR Part 60 on the nature of the seismic and geologic hazards present at a geologic repository." The general position thus stated is qualified by additional statements in the section.

"Discussion": The basic regulatory requirement with respect to the earthquake hazard is identified as follows: "structures, systems, and components important to safety shall be designed so that this natural phenomenon, as anticipated at the geologic repository operations area, will not interfere with necessary safety functions." The discussion continues by presenting a number of elements of proof, based on the language of 10 CFR Part 60, that are related to this basic regulatory requirement. For each element of proof the section discusses appropriate compliance demonstration methodologies. Finally, these methodologies are compared with the excerpted elements of Appendix A that prescribe methodologies for evaluating the seismic hazards at a nuclear power plant.

3.0 Justification for Staff Effort

The main reason that the HLWM staff is undertaking this effort is to clarify the position of the NRC with respect to the applicability of the guidance afforded by Appendix A and its associated RG's and SRP's, in evaluating the geologic hazard present at a geologic repository. The applicability of Appendix A is not specifically addressed in 10 CFR Part 60. Some of the methods in Appendix A and its associated RG's and SRP's have, however, been identified by the HLWM staff as being applicable to the geologic repository facilities. In certain circumstances, the methods of Appendix A may be suitable; however, the staff may wish to develop more conservative positions for the repository. If this were the case, and the staff left the adoption of portions of Appendix A and its RG's and SRP's to the discretion of the DOE, it would be difficult to establish an internally consistent position. Hence, by having the staff identify positions from Appendix A it believes are appropriate for the HLW program, the staff will have reduced confusion. It is the staff's job to develop guidance that can be used by DOE to demonstrate compliance with the regulations. This TP endorses the use of appropriate portions of Appendix A in the HLW program.

4.0 General Information

TP Relation to Review Process: As previously indicated, the TP identifies portions of Appendix A and its RG's and SRP's that are applicable to the HLWM program and 10 CFR Part 60. The information is in the form of a TP since the HLWM staff may not adopt all of the positions expressed in Appendix A and its RG's and SRP's. For those positions proposed to be adopted by the staff, it is beneficial to provide the opportunity for public comment. The TP process allows for such comments; thereby permitting a more carefully considered position than would direct correspondence with DOE. Finally, although this information will ultimately be incorporated into the HLWM License Application Review Plan, it also needs to be provided to DOE for guidance in the early stages of facility design and site characterization.

Previous Guidance to the DOE: There has been considerable interaction between the DOE and the NRC regarding appropriate methodologies for evaluating the earthquake hazard at a geologic repository. In a letter from Ralph Stein of the DOE to Hubert Miller of the NRC, dated June 20, 1985, the DOE provided the NRC with an annotated outline of the "Rationale for Seismic/Tectonic Investigations for Licensing a Nuclear Waste Repository." In his cover letter for this annotated outline Mr. Stein indicated, "This [DOE program-wide position] will remove uncertainty with respect to the use of other existing Federal Regulations, such as Appendix A to 10 CFR Part 100, which may not be directly applicable to [a] nuclear waste repository." The annotated outline was the subject of a meeting between the DOE and the NRC on December 3-4, 1985. The applicability of Appendix A as a method of investigation was not discussed at that meeting. According to the summary of the meeting, the NRC and the DOE agreed that the annotated outline, "provides an acceptable rationale from which

to determine seismic/tectonic investigations to be conducted during site characterization." The NRC and DOE also agreed that, "the need to consider specific pre-closure and post-closure events, processes, and phenomena should be based upon a consideration of their effects on compliance with the performance requirements of 10 CFR 60." A final version of the annotated outline, including changes resulting from NRC/DOE interactions, was provided to the NRC as an attachment to a letter, dated October 10, 1986, from James Knight of the DOE to John Linehan of the NRC. In its response (letter from John Linehan to James Knight, dated January 12, 1987), the NRC staff stated, "In most cases both straight deterministic and deterministic/probabilistic evaluations should be used along with consequence[s] analysis in the evaluation of disruptive events. Historically the licensing judgements of the NRC have factored consequence[s] into the decision process." Also, in response to a request from the HLWM/Repository Projects Branch (made after its review of an earlier version of the TP), the HLWM/Geotechnical Branch provided a detailed justification of the applicability of Appendix A to 10 CFR Part 60 in a memorandum, dated November 14, 1986, from John Trapp and Seth Coplan to John Linehan. A primary reason for tending toward a more direct application of Appendix A to the geologic repository program was that NMSS/IMNS, in its position regarding Monitored Retrievable Storage (MRS), has stated that it would use Appendix A to evaluate seismic hazards at MRS sites west of the Rocky Mountains. This position was incorporated into the memorandum cited above as well as the earlier version of the TP. As a result of these activities and subsequent interactions with the DOE and with other elements of the NRC, the HLWM staff decided to take a clearer position with regard to the applicability of Appendix A to the geologic repository program.

Role of CNWRA in TP Development: It is expected that the CNWRA will play an increasingly significant role in providing peer review during the development of the public comment draft of the TP, during the evaluation of the comments received on the public comment draft, and during the development of the final TP.

Project Schedule: The project schedule for completion of the TP is contained in Attachment A. Because this TP is already in the late stages of development and a draft for internal review is nearing completion, the annotated outline required in Item (6) of Section 4.2 of the Work Plan for the Development of Staff Technical Positions was not included herein.

Preliminary Meetings: No public meetings are required before issuance of the public-comment draft. However, internal meetings will be held with other NRC elements such as NMSS/IMNS, NRR, and RES, to inform them of our intended use and to solicit comments from them based on their first-hand working knowledge of Appendix A.

**ATTACHMENT A
MILESTONES AND SCHEDULES**

Schedule *

Milestone	Elapsed Time (wk)	Accumulated Time (wk)	Date
Start Date, Obtain PPSAS No., Preliminary Meeting	0	0	**
Complete Scope	4 *	4	88/11/01
Determine TP Need	1	5	88/11/08
Complete Internal NRC Draft	2 *	7	88/11/18
Receive Internal Draft Comments	4	11	88/12/15
Complete Public Comment Draft	8	19	89/02/09
Transmit to ACNW/Federal Register Notice	3	22	89/03/02
Public Draft Comment Period Closes	8	30	89/04/27
Evaluate Comments and Revise TP	6	36	89/06/08
Comment Resolution Public Meeting	2	38	89/06/22
ACNW Meeting	2	40	89/07/06
Complete Final TP	4	44	89/08/03
Issue Final TP	4	48	89/08/31

* Based on HLWM TP Development Work Plan Issuance (88/10/03); milestones for completing the scope and for completing the internal draft differ from the standard because of the need to submit scopes for ongoing TPs by November 1, 1988 and because the internal draft of the ongoing TP is about 2 weeks from completion.

** Not needed because this TP is already under development; the FY89 resource allocation numbers are: PPSAS# 411132 and TACS# L60037