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JAN 30 1989

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Mel Silberberg, Chief
Waste Management Branch
Division of Engineering, RES

FROM: Ronald L. Ballard, Chief
Geosciences and Systems Performance Branch
Division of High-Level Waste Management, NMSS

SUBJECT: NRC TECHNICAL POSITION: TECTONIC MODELS IN THE ASSESSMENT OF PERFORMANCE OF HIGH-LEVEL RADIOACTIVE WASTE REPOSITORIES

An internal draft of the Tectonic Models Technical Position (TP) is enclosed for review by your organization. Review criteria are given in Appendix A of Waste Management Policy No. 46, "Work Plan for the Development of Technical Positions." One of the review criteria in the appendix calls for identification of links between this position and related issues. On this matter we ask for your comments on whether other models, such as an integrated tectonic/hydrologic/climatologic model or numerical models should also be discussed in this document. A copy of this appendix is also enclosed.

Your staff's comments on this TP are solicited in order that the Geosciences and Systems Performance Branch (HLGP) staff may prepare the final draft for external review by April 10, 1989. We would appreciate receiving the comments

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by February 27, 1989, to allow sufficient time to make any additions or corrections before the April 10, 1989 target date. If you have any questions concerning this document, please contact Keith McConnell of the HLGP staff at X20532.

/s/ P. Justus

Ronald L. Ballard, Chief
Geosciences and Systems Performance Branch
Division of High-Level Waste Management, NMSS

Enclosures:
1. GTP
2. Waste Mgmt Policy #46,
   Appendix A

DISTRIBUTION

Central Files	RBrowning, HLWM	JYoungblood, HLWM	RBallard, GP
HLGP r/f	KMcConnell, HLGP	SCoplan, HLGP	NMSS r/f
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PDR & LPDR

Please see previous concurrence.

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OFC	HLGP	PMDA	HLGP	DHLGP			
NAME	KMcConnell/cj:	EKraus	PJustus	RLBallard			
DATE	1/ /89	1/ /89	1/27/89	1/27/89			

JAN 30 1989

TECTONIC/1/

by February 12, 1989, to allow sufficient time to make any additions or corrections before the April 10, 1989 target date. If you have any questions concerning this document, please contact Keith McConnell of the HLGP staff at X20532.

/s/

Ronald L. Ballard, Chief
Geosciences and Systems Performance Branch
Division of High-Level Waste Management, NMSS

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OFC	HLGP	PMDA	HLGP	HLGP			
NAME	KMcConnell/cj	EKraus	PJustus	RLBallard			
DATE	1/30/89	1/ /89	1/ /89	1/ /89			

Enclosure 1

TECHNICAL POSITION ON TECTONIC MODELS IN THE ASSESSMENT OF PERFORMANCE OF HIGH-LEVEL RADIOACTIVE WASTE REPOSITORIES

TECHNICAL POSITION ON TECTONIC MODELS IN THE ASSESSMENT OF PERFORMANCE OF HIGH-LEVEL RADIOACTIVE WASTE REPOSITORIES

TECHNICAL POSITION ON TECTONIC MODELS IN THE ASSESSMENT OF PERFORMANCE OF HIGH-LEVEL RADIOACTIVE WASTE REPOSITORIES

1. INTRODUCTION

1.1 Purpose

This Technical Position on tectonic models is undertaken to document the U.S. Nuclear Regulatory Commission (NRC) staff's position on the requirement for the support and implementation of tectonic model(s) in performance allocation and performance assessment. The need for this Position stems from the NRC staff's concern about the use of models in performance allocation and performance assessment. The NRC staff have noted that the full range of alternative conceptual models supported by available evidence has not been identified in the site characterization program at Yucca Mountain and that the program as described in the Consultative Draft Site Characterization Plan (CDSCP) (see Ref. 1) may favor providing data that confirm the preferred model rather than the data needed to determine what the perferred model should be. In the CDSCP (see Ref. 1), the U.S. Department of Energy (DOE) has indicated that they intend to use models in the performance assessment process and, as a result, they are required under 10 CFR Part 60 (Sections 60.21 and 60.101) (see Ref. 2) to thoroughly support those models. The objectives of this Position are to: (1) outline the regulatory requirements for support of tectonic models; and (2)

suggest the types of information required and the steps, in the process of using tectonic models, that should be included in the Site Characterization Report and License Application. Adherence to this Technical Position will ensure the correct use of tectonic models and the completeness of the information provided, and will help reduce review time.

1.2 Scope

The guidance presented in this Technical Position on tectonic models will provide the U.S. Department of Energy (DOE) with a regulatory perspective for the use of tectonic models during site characterization and the licensing process. This guidance will specifically describe the NRC staff's position on the use of tectonic models in the performance allocation and performance assessment processes.

1.3 Structure of Technical Position

Specific points to be addressed in the Technical Position include:

1) a regulatory analysis of the implementation of "predictive models," in general, and tectonic models, in particular under 10 CFR Part 60;

2) the NRC staff's position on the use of tectonic models in the performance allocation and performance assessment processes;

3) a list of information necessary to demonstrate compliance with 10 CFR Subsection 60.21(c)(1)(ii)(F).

1.4 Alternatives

Technical Positions are issued to describe and make available to the public criteria for methods acceptable, to the NRC staff, for implementing specific parts of the Commission's regulations, or to provide guidance to the DOE. Technical Positions are not substitutes for regulations, and compliance with them is not required. Methods and solutions different from those set out in the Position 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.

2. REGULATORY BACKGROUND

2.1 Requirements

Under 10 CFR Part 60, DOE is required to thoroughly support models used for determining the long-term performance of a repository. This requirement for the development and confirmation of models is specified in 10 CFR Subsection 60.21(c)(1)(ii)(F) and supported in 10 CFR Subsection 60.101(a)(2), which state that:

DOE should provide "...an explanation of measures used to support models used to perform the assessments required..." and "Analyses and models that will be used to predict future conditions and changes in the geologic setting shall be supported using an appropriate combination of such methods as field tests, in situ tests, laboratory tests which are representative of field conditions, monitoring data, and natural analog studies...." [Subsection 60.21(c)(1)(ii)(F)]; and

Demonstration of compliance with long-term performance objectives and criteria will "involve the use of data from accelerated tests and predictive models that are supported by such measures as field and laboratory tests, monitoring data and natural analog studies" [Subsection 60.101 (a)(2)].

2.2 Implementation of Requirements under 10 CFR Part 60

As defined in Subsection 60.21(c)(1)(ii)(F), "predictive models" are models used to predict future conditions and changes in the geologic setting. In this Technical Position, tectonic models are considered to be predictive models, because they are used to predict future conditions and changes in the geologic setting in response to tectonic processes.

The use of predictive models, in particular tectonic models, results from gaps in the geologic record in the area of the site. Gaps in the geologic record result in a database that is insufficient to establish the full range of

geologic conditions and parameters at the site. Total reliance on the empirical database is, therefore, likely to result in an inability to predict the potential for the presence of "undetected" features at the site and an inability to completely bound the possible future behavior of natural systems. For example, an estimate of the likelihood of a tectonic event that could disrupt the repository can only be made on the basis of the geologic record for a particular site. Gaps in the geologic record may lead to unacceptably high levels of uncertainty about the likelihood of this event. In circumstances like those described above, reliance on models based on the available data is necessary to bound the likelihood of possible disruptive geologic events.

2.2.1 Preclosure Period In the preclosure period, the performance objectives for releases of radioactive material [Subsection 60.111 (a)] and the retrievability of waste [Subsection 60.111 (b)] require that the design of the repository operations area must be such that: 1) "...until permanent closure ...radiation exposures and radiation levels, and releases of radioactive materials to unrestricted areas, will at all times be maintained within the limits specified in Part 20..." and 2) "...any or all of the emplaced waste could be retrieved on a reasonable schedule starting at any time up to 50 years after waste emplacement operations are initiated...." To assure that the design of the repository operations area will meet the performance requirements, the bounding conditions of possible tectonic events in the repository operations area should be established to develop design bases. The use of thoroughly documented tectonic models is a mechanism for bounding the tectonic events that are reasonably likely to occur in the preclosure period.

2.2.2 Postclosure Period During the postclosure period, the objectives of the long-term performance of a potential repository are outlined in 10 CFR Section 60.112 (specifies the performance requirements for the overall system) and Section 60.113 (specifies the performance requirements of particular barriers after permanent closure). More generally, 10 CFR Sections 60.2 and 60.122 identify the requirements for investigating geologic conditions at the site.

Under Section 60.112,

> "The geologic setting shall be selected and the engineered barrier system and the shafts, boreholes and their seals shall be designed to assure that releases... conform to such generally applicable environmental standards for radioactivity as may have been established by the Environmental Protection Agency with respect to both anticipated processes and events and unanticipated processes and events."

As will be described, tectonic models have a key role in determining the processes and events that are reasonably likely to occur in the period of concern for the repository and, therefore, in defining anticipated and unanticipated processes and events. For DOE to provide reasonable assurance that the long-term performance of the repository will meet the requirements under Section 60.112, it should demonstrate that the full range of alternative tectonic models, supported by available evidence, has been identified and evaluated for potential adverse effects on the overall system performance.

Under Section 60.113,

"The engineered barrier system shall be designed so that assuming anticipated processes and events: (A) Containment of HLW [high level waste] will be substantially complete during the period when radiation and thermal conditions in the engineered barrier system are dominated by fission product decay; and (B) any release of radionuclides from the engineered barrier system shall be a gradual process which results in small fractional releases to the geologic setting over long times."

Similar to the overall system performance requirement, Subsection 60.113(a)(1)(i) requires that the engineered barrier system be designed assuming anticipated processes and events which, in large part, can be defined using conceptual tectonic models. However, Subsection 60.113(a)(1)(i) also requires that releases from the engineered barrier system be gradual over long times. This requirement, strictly interpreted, places narrow constraints on the allowable uncertainty in identifying anticipated events used in the design of the engineered barrier system. For example, rupturing of cannister(s) by fault movement could result in an abrupt release of radionuclides from the engineered barrier over a relatively short period of time, which may violate Section 60.113. DOE should demonstrate that the methods used to derive projections of future tectonic processes and events, including the use of tectonic models, are sufficiently constrained to assure that the design of the engineered barrier system will meet the performance objective.

10 CFR Section 60.2 requires that the program of exploration and research undertaken during site characterization should establish the geologic conditions and the ranges of those parameters at a particular site. The procedure for fulfilling Section 60.2 is outlined in 10 CFR Subsections 60.122(a)(2)(i) and (ii) which states that the DOE should demonstrate that:

> " The potentially adverse...natural condition[s] has [have] been adequately investigated, including the extent to which the condition may be present and still be undetected taking into account the degree of resolution achieved by the investigations"; and that "The effect of the potentially adverse ... natural condition on the site has been evaluated using analyses which are sensitive to the potentially adverse ...natural condition and assumptions which are not likely to underestimate its effect."

Tectonic models describe the geometric and mechanical relationship between observed structural features and past and/or present tectonic processes. In addition to describing observed structural features, tectonic models, as defined in this report, may also lead to the recognition of significant structural features or processes that cannot be readily identified by conventional methods of investigation. The potential for future tectonic events has a direct impact on performance allocation and on the design and location of subsurface facilities, as well as on the design of the engineered barrier system. Tectonic models, therefore, provide investigators a basis from which to evaluate future tectonic events and potentially disruptive scenarios.

2.2.3 Anticipated and Unanticipated Processes and Events Tectonic models have a key role in determining the processes and events that are reasonably likely to occur in the period of concern for the repository (i.e., anticipated processes and events). The determination that a tectonic process is an anticipated process necessitates the development of a "reasonable and conservative projection of the rate of the process that is occurring or that has occurred, within the geologic setting during the Quaternary Period" (Draft Generic Technical Position on "Anticipated and Unanticipated Processes and Events,"..see Ref. 3). An incomplete geologic record in the area of the repository necessitates that, with respect to tectonics, a conceptual model based on empirical geologic data derived during site characterization be used to help identify processes reasonably likely to have been active in the geologic setting during the Quaternary.

2.2.4 Tectonic Models as a Basis for Scenario Selection As a result of their role in defining which processes and events are anticipated and unanticipated processes and events, tectonic models will also play a key role in the development of a comprehensive list of scenarios. To develop a complete list of mutually exclusive scenarios for tectonics at the Yucca Mountain site, a comprehensive model or set of models of tectonic activity must be available on which to base the selection. The NRC staff emphasized the need for the use of models in the development of scenarios in the DOE-NRC Alternative Conceptual Models Workshop (April, 1988, see Ref. 4). In that meeting, the NRC staff stated that models:

"if confirmed, be used to calculate releases for all scenarios needed to show compliance with the EPA standard" (NRC comments, DOE-NRC Alternative Conceptual Models Workshop April, 1988, see Ref. 4).

3. TECHNICAL POSITION

A) Tectonic models should form the basis for preliminary performance allocation, with respect to tectonic factors, and provide a mechanism for prioritizing those investigations that have the greatest potential for resolving issues associated with tectonic features, events, or processes that could lead to the site being considered unlicensable, or to substantial change in the site characterization program.

B) Development and use of alternative tectonic models in the assessment of conditions at the site should begin with site characterization and continue until permanent closure, to take into account field conditions actually encountered.

C) A full range of tectonic models and associated boundary conditions should form the basis for investigations carried out during site characterization and for assessment of the ability of the site to meet the performance objectives identified in 10 CFR Part 60.

1) alternative tectonic models should form the basis for input into the identification of anticipated processes and events and, therefore, in the design of the engineered barrier system; and

2) alternative tectonic models should form the basis for input related to tectonics in the development of a comprehensive list of scenarios needed to show compliance with the EPA standard.

D) Within tectonic models, the identification of processes and events that will be considered to be anticipated processes and events should be based on deterministic criteria, not probabilities (Draft Generic Technical Position, see Ref. 2). As a result, professional judgment and peer review should be important mechanisms for classification of processes and events.

E) Tectonic models should be based on a careful review of the full geologic record. Within tectonic models, identification of unanticipated processes and events should be based on a review of the full geologic record, while identification of those processes and events considered as anticipated must be based on a careful review of the record of the Quaternary Period.

F) Data generated in the program of site characterization and used as a basis for tectonic models should be representative of the events and processes in the geologic setting and be such that the full range of conditions at the site can be determined. In addition, DOE should demonstrate that the sample population

of data used to construct three-dimensional geologic models of the site is representative of the entire repository block.

4. DISCUSSION

4.1 Rationale for the Position on the Use of Alternative Tectonic Models

Concerns about the use of predictive models during characterization of the proposed repository at Yucca Mountain were presented to the DOE in the NRC staff's review of the Nevada Nuclear Waste Storage Investigations (NNWSI) Consultation Draft Site Characterization Plan (CDSCP) (see Refs. 5 and 1). In that review the NRC staff noted that the full range of alternative conceptual models supported by available evidence from the Yucca Mountain area had not been systematically and clearly identified. The NRC staff concluded that alternative conceptual models should form the basis for preliminary performance allocation and performance assessments of repository systems and subsystems. In the April, 1988, workshop on Alternative Conceptual Models (see Ref. 3), DOE agreed that it would provide in the statutory Site Characterization Plan (SCP) a table listing the full range of conceptual models for all major disciplines.

However, providing tables of alternative conceptual tectonic models or alternate hypotheses in conceptual models does not, by itself, resolve the NRC staff's concern that alternative conceptual models form the basis for preliminary performance allocation and performance assessment. As outlined

previously, tectonic models should form a conceptual basis on which to identify those processes and events that are reasonably likely to occur, as well as form a conceptual basis for assessing the likelihood and consequences of interaction between tectonic events over the period of performance.

4.2 Information Needs for Bounding Natural Conditions in Tectonic Models

All models of natural events require certain elements to make them complete. Listed below are suggestions as to what is necessary to have a complete conceptual tectonic model or set of tectonic models.

4.2.1 Discussion of Events and Processes

4.2.1.1 Tectonic Framework A discussion to include the major and minor tectonic features of the candidate area. Also includes maps and cross-sections of sufficient detail to show the major geologic units and structural features that could affect or be affected by the repository.

4.2.1.2 Tectonic History A discussion of the tectonic history of the candidate area, including all recognizable tectonic elements, but with particular emphasis on those formed in the Quaternary Period. The tectonic history should include the age and sequence of formation of all major tectonic features.

4.2.1.3 Volcanic History A discussion of the volcanic history of the candidate area and site. The discussion should include a listing of all volcanic episodes, the type of event (i.e., extrusive or extrusive-intrusive), composition of volcanics, age, mechanism of eruption, geometric relationship to other volcanics, and structural control of volcanism. Also included should be a description of volcanic processes and possible analogs, as well as, details of alteration, contact metamorphism and metasomatism, mineralization of country rock, associated faulting and fracturing, and effects on hydrologic factors.

4.2.1.4 Faulting History A discussion of the faulting history of the candidate area to include the distribution, length, strike and dip of fault planes, and width and nature of the fault zones. Also included should be the sense of movement along faults tied to possible mechanisms of crustal deformation. Information on surface offsets and net slip of all proven or suspected Quaternary faults should be given, along with the amount of offset on basement associated with each fault. The movement history of faults, including segmentation, ages of movement, the rate of displacement, interaction, and recurrence interval should be outlined. All assumptions and uncertainties should be explicitly stated.

4.2.1.5 Folding History A discussion of the folding history of the candidate area and site, including the geometry, symmetry, wavelength and amplitude of folds, their mode of origin and their attitude relative to

the earth surface. Folding in association with faulting should be described.

4.2.1.6 Jointing History A discussion of the jointing history of the candidate area and site including the location and trend of all known joint sets, the areal distribution, attitude and intensity of jointing within the candidate area, as well as the origin and possible association with faulting.

4.2.1.7 Uplift, Tilting, Rotation, and Subsidence A discussion of uplift, tilting, rotation, and subsidence in the candidate area and site, including the suspected causes of uplift, tilting, rotation, and subsidence, as well as the rate, magnitude, and areal extent. Discussion of data on crustal movements should be summarized and tabulated. Time-dependent gravity and geodetic surveys and geomorphic analyses of landforms should be summarized.

4.2.1.8 Stress Field History A discussion of the stress field in two categories: past configurations of the stress field based on the geology of the area and the present stress field as indicated by stress measurements (e.g., overcoring, hydrofracing). A description of the implications of stress field measurements on possible future fault movements should be included.

4.2.1.9 Seismicity of the Candidate Area A discussion of the seismic history of the area, including relating historic earthquakes to seismic zones and tectonic features, if possible. Also included should be a discussion of the probability of future major earthquakes within the candidate area and information on tectonics and stress distribution.

4.2.2 Representativeness of Database 10 CFR Sections 60.2 and 60.15 require that DOE establish the geologic conditions and the ranges of those parameters at a particular site. This requirement is key in assessing the representativeness of the database used to construct alternative tectonic models, in that the ranges of geologic conditions must be established for a particular site, prior to development of a credible model(s). Also important to the question of representativeness of data is the requirement that potentially adverse conditions be investigated, based on procedures outlined in 10 CFR Section 60.122. Key to the concept of representativeness is the statement in Section 60.122 (see section 2.2.2, "Postclosure Period," p. 10) that potentially adverse conditions must be investigated "...including the extent the condition may be present and still be undetected...." This procedure requires that a thorough analysis of potentially adverse conditions at the site be performed. Therefore, potentially adverse tectonic conditions such as faults and tectonic related fractures must be thoroughly investigated to assess their potential effects on the site's ability to isolate waste.

Also of importance to the concept of representativeness and the interface with alternative tectonic models are requirements in 10 CFR Subsection

60.21(a)(1)(ii)(F) that analyses and models used to predict future conditions "shall be supported by... field tests, in situ tests, laboratory tests which are representative of field conditions ...." This requires DOE to demonstrate that any sample population of data from the site used to support tectonic models in the assessment of future conditions at the repository is representative of conditions in the controlled area.

DOE should demonstrate that the program of investigations conducted during site characterization is sufficient to adequately investigate potentially adverse tectonic conditions and their effects on waste isolation. In addition, DOE should provide reasonable assurance that the sample population of data derived during site characterization and used to construct three-dimensional geologic models is representative of the entire repository block.

4.3 The Use of Probabilities in Tectonic Models

Probabilistic hazard analysis, in the consideration of credible processes and events considered in the development of a full range of alternative tectonic models may prove to be a valuable supportive tool. However, the Commission has recognized (Federal Register, V. 48, No. 120, June 21, 1983, see Ref. 6) and the staff has reiterated (Draft Generic Technical Position, see Ref. 3) that the "Identification of anticipated and unanticipated processes and events for a particular site will require considerable judgment and will not be amenable to accurate quantification, by statistical analysis, of their probability of occurrence." As a result of this position on the use of probabilities, primary

identification of anticipated and unanticipated processes and events used in the development of tectonic models should, therefore, be based on deterministic criteria (modified after draft Generic Technical Position, see Ref. 3)

Probabilities should be used to support and aid in quantifying the results of professional judgment. The effectiveness of probabilistic hazard analysis is the result of its capability to integrate a wide range of information and judgment and their associated uncertainties into a flexible framework (Reiter, 1988, see Ref. 7). However, the use of probabilities for purposes of tectonic models is limited by the information that is available for placing into probability calculations. Specifically, a lack of understanding of the basic processes that cause tectonic events and inadequate techniques for accurately and precisely assessing information in the geologic record generally lead to input that relies on highly judgmental opinions with little resolution (Reiter, 1988, see Ref. 7). Factors such as those described above lead Callender (Sandia 86-0196, see Ref. 8) to conclude that: "At present, no tectonic or seismologic method is completely adequate to quantitatively assess, with a high degree of certainty, the probability of tectonic activity at a repository site."

5. REFERENCES

1. U.S. Department of Energy, "Consultation Draft Site Characterization Plan" for the Yucca Mountain Site, January 8, 1988.

2. 10 CFR Part 60 (Code of Federal Regulations), Title 10, "Energy," Part 60, "Disposal of High-Level Radioactive Wastes in Geologic Repositories," U.S Government Printing Office, Washington, DC, 1988.

3. U.S. Nuclear Regulatory Commission, " Draft Generic Technical Position on Anticipated and Unanticipated Processes and Events," February, 1988.

4. U.S. Nuclear Regulatory Commission, "Comments at the DOE-NRC Workshop on Alternative Conceptual Models," April, 1988.

5. U.S. Nuclear Regulatory Commission, Letter, from R.E. Browning, U.S. Nuclear Regulatory Commission, to R. Stein, U.S. Department of Energy, dated May 11, 1988, Subject, "NRC Staff Review of the Department of Energy's January 8, 1988, Consultation Draft Site Characterization Plan for the Yucca Mountain Site."

6. U.S Nuclear Regulatory Commission, "Disposal of High-Level Radioactive Wastes in Geologic Repositories, Technical Criteria," Federal Register, Vol. 48, No. 120, June 21, 1983, 28194-28229.

7. L. Reiter, "Probabilistic Seismic Hazard Analysis - Lessons Learned, A Regulator's Perspective," Presentation to Second Symposium on Current Issues Related to Nuclear Power Plant Structures, Equipment and Piping, Electric Power Research Institute, 1988.

8. J.F. Callender, "Tectonics and Seismicity in Final Draft, Techniques for Determining Probabilities of Events and Processes Affecting the Performance of Geologic Repositories," SAND86-0196, 1988.

9. American Geological Institute, Glossary of Geology, 1972, Washington, DC, 805 p.

6. GLOSSARY*

Geologic Setting: "the geologic, hydrologic, and geochemical systems of the region in which a geologic repository operations area is or may be located." (10 CFR Section 60.2)

Tectonics: "A branch of geology dealing with the broad architecture of the upper part of the Earth's crust, that is, the regional assembling of structural or deformational features, a study of their mutual relations, their origin, and their historical evolution." (American Geological Institute Glossary, see Ref. 9) [Under 10 CFR Part 60, tectonics would be one of the systems operating in the region in which the geologic repository operations area is located].

Tectonic Setting: As a part of the "Geologic Setting," the tectonic setting is a description of the basic architecture of the upper part of the Earth's crust in the region of the repository operations area. The tectonic setting would not include projections nor predictions of tectonic activity.

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* Some definitions are taken from the American Geological Institute's Glossary of Geology (see Ref. 9).

Conceptual Model: "A pictorial and/or narrative description of the repository system or subsystem that is intended to represent one or more of the following:

- relevant components of a system and/or subsystem

- interactions between the various components and/or subsystems and/or systems." (NRC comments, DOE-NRC Alternative Conceptual Models Workshop, April, 1988, see Ref. 4 of this Technical Position)

Predictive Model: A conceptual model that involves dynamic processes acting in the geologic setting and that is used to predict future conditions or changes in the geologic setting.

Tectonic Model: A predictive model that pictorially and/or by use of a narrative provides a description of the tectonic system of the geologic setting to include structural and deformational features (i.e., tectonic framework), their mutual relations, their origin, and their history. The conceptual tectonic model in a regulatory framework would emphasize events and processes having occurred in the Quaternary and would include a projection of the rates and probabilities of tectonic processes and events into the future.

Enclosure 2

APPENDIX A

TECHNICAL POSITION REVIEW CRITERIA

In reviewing the internal draft of a Technical Position (TP), the responsible staff members should review the TP from the perspective of the U. S. Department of Energy (DOE) and other potential interested parties to be sure that intent is clear. Questions that should be considered include:

- Does the TP have clarity?

  1. Is it readable?
  2. Is the logic clear?
  3. Is the relationship to the regulations clear?
  4. What is the main message?

- Will DOE be able to understand what we are expecting from it?

- Are the staff's positions consolidated in one place in the TP as opposed to being spread out over many different sections so that what we are asking can easily be determined.

- Is the organization of the TP adequate for meeting the standard for TPs and in keeping with its purpose?

  1. Background and Purpose
  2. Technical Position
  3. Rationale

- Is the TP explicitly organized in this way or if not, does it effectively communicate these items?

- Are the staff's positions reasonable, practicable, supportable, comprehensive, sufficient?

- If the staff's position sets forth a detailed description of a compliance demonstration method, does it have adequate justification?

- Is the use of should, could, and must appropriate and accurate?

- Are links with related issues and requirements clearly identified?

- Is the style of the TP acceptable?

  Tone — Is the choice of language objective?

  Clarity — Is the TP succinct and clear?

Coherence Are the main points clear and logically connected? Do they hang together?

Emphasis Are the main points identifiable? Do the structure and format aid clarity (i.e., is it easy to read)?

Unity Is the discussion focused?