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**CNWRA WORK PLAN
TO ASSIST NRC IN THE DEVELOPMENT OF
REGULATORY AND TECHNICAL GUIDANCE ON
ISSUES RELATED TO TECTONICS**

Prepared for

**Nuclear Regulatory Commission
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I. BACKGROUND

Tectonic processes and resultant geologic structures and land forms are fundamentally important elements of the immediate site and regional geologic setting of a potential geologic repository of high-level radioactive waste. Tectonic processes (e.g., faulting, and fracturing of geologic materials) are among the most potentially disruptive natural phenomena that may affect a geologic repository. Performance assessment, analysis of risk due to natural hazards, design evaluation of surface/subsurface facilities and development of effective regulatory guidance will require comprehensive description and substantial understanding of tectonic processes and geologic structures.

Fourteen of the twenty-four potentially adverse conditions in 10 CFR Part 60 are directly related to, or significantly influenced by, tectonics and geologic structure. Two dimensional (cross sections and structure contour maps of geologic strata) and three dimensional (surface and solid) models of the geometry, kinematics and dynamics of tectonic processes and geologic structures should be an important part of site characterization. Therefore, it is likely that Nuclear Regulatory Commission (NRC) staff will require considerable capability to review and evaluate these models. Staff will need to understand coupling of tectonic/magmatic/hydrologic systems and implications for associated interactions between natural and engineered barrier systems.

II. TASK DESCRIPTION

Assistance in the development of regulatory and technical guidance for tectonics is identified as Task 2, Subtask 2.1.7 in the Geologic Setting Program Element section of the Center for Nuclear Waste Regulatory Analyses (CNWRA) FY92-93 Operations Plans for the Division of High-Level Waste Management (DHLWM) (Revision 1, Change 0, August 1991).

The intent of this work plan is to provide a rational regulatory framework within which to determine specific scientific methods, data and information requirements, and analytical and data management tools needed by NRC staff to implement regulations, develop guidance and assess compliance. CNWRA staff will support NRC to determine the necessary and sufficient types and scope of regulatory guidance on issues related to tectonics. A key emphasis of this work plan is on prioritization of the important issues related to tectonics and natural deformation of a proposed repository site. Although some technical work will be accomplished in direct support of the Systematic Regulatory Analysis (SRA) process, most of the analytical and technical regulatory assessment methods are developed in the Task 3 work plan (CNWRA

WORK PLAN TO ASSIST NRC IN THE DEVELOPMENT OF ANALYSIS CODES AND METHODS IN TECTONICS AND STRUCTURAL GEOLOGY).

The objectives of this task are to provide technical assistance in the (i) development of technical positions, staff positions and related regulatory guidance, (ii) development of rules and amendments, and (iii) preparation of technical input for other guidance documents. Analytical support may be required for regulatory and technical guidance development, and will be provided, at the request of NRC staff, as an integral part of the technical assistance activities in the categories given above. Geologic Setting Program Element (GS) staff will investigate the important issues in tectonics using an approach that includes (a) regulatory history and intent; (b) Systematic Regulatory Analysis of the pertinent parts of the regulation; and (c) development of a technical and regulatory basis for preparation of precicensing guidance to, and interactions with the Department of Energy (DOE), if necessary.

A. TASK ORGANIZATION

The activities to be performed in accomplishment of this subtask are subdivided into five separate phases as indicated below:

PHASE 1: Provide Systematic Regulatory and Technical Analyses.

PHASE 2: Determine the Viability of Potential Compliance Determination Methods.

PHASE 3: Support NRC staff in the Development of Precicensing Regulatory Guidance and in NRC/DOE/NV Technical Exchange Meetings, and Related Meetings.

PHASE 4: Develop and Incorporate Detailed SRA Information into PASS Relational Database.

PHASE 5: Integrate Tectonics Regulatory Guidance/Products into the Format and Content Regulatory Guide (F&CRG), and the License Application Review Plan (LARP).

B. TASK ACTIVITIES AND DELIVERABLES

PHASE 1: Provide Systematic Regulatory and Technical Analyses.

In the first phase of the subject work, CNWRA staff will determine the important issues, problems and uncertainties related to tectonics, geologic structure and tectonic deformation of a potential repository site, and will support NRC to determine the regulatory basis for development of guidance and assessment of compliance with 10 CFR Part 60. CNWRA staff will apply Systematic Regulatory Analysis to review 10 CFR Part 60. Phase 1

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activities will, in effect, specify the regulatory basis for analysis of issues and concerns related to tectonics.

As part of with Phase 1 SRA activities, CNWRA staff will conduct preliminary assessments of potential compliance determination methods (CDMs) for addressing tectonics issues. CNWRA staff will recommend additional computer modeling investigations for completion in Task 3 of the GS Program Element beginning in FY92.

Activity 1.1: Identify pertinent Regulatory Requirements (RRs) in 10 CFR Part 60

NRC and CNWRA staff will review the current list of Regulatory Requirements, contained in the RR/Regulatory Elements of Proof (REOP) report. Staff will identify the RR or set of RRs considered to be primarily tectonic issues, and which are appropriate for treatment under this work plan. It is anticipated that two or three RRs will be analyzed under this plan. Staff will identify RRs more appropriate for treatment under the Probabalistic Fault Displacement (PFD) & Seismic Hazard Analysis (SHA) work plan. (Intermediate Milestone 3702002510-011).

Activity 1.2: Support NRC review of RR/REOP Report

CNWRA staff will support NRC review of the RR/REOP Report by providing related technical information and assistance and with Intermediate Milestone 3702002510-011, which will include a review and analysis of 10 CFR Part 60 for all issues related to tectonics. Support may also include, with appropriate concurrence of CNWRA and NRC staff, a scoping review of the Site Characterization Plan (SCP) and pertinent DOE Study Plans on tectonic problems. Regulatory Elements of Proof will be examined for consistency with the RRs chosen for analysis under this work plan. The REOP describes what the license applicant must demonstrate with respect to a specific RR. CNWRA will determine the adequacy of the various REOP's.

Activity 1.3: Develop proposed CDS LA Review type (Type 1 -5) and submit for NRC approval

A Compliance Determination Strategy (CDS) must be developed for each RR and its set of REOPs. The assigned CDS License Application (LA) Review type identifying the scope and level of detail to which the SRA process is applied to the parent RR. CNWRA staff will recommend the CDS type for each RR considered for treatment under this work plan (Intermediate Milestone 3702002510-013) and submit each to the NRC for review and concurrence.

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Activity 1.4: Develop Compliance Determination Strategy

CNWRA staff will support NRC to determine the most appropriate current approach to development of a CDS when a review type is established. Staff will attempt to determine if sufficient information is available on the DOE program plan to allow meaningful consideration of a longer-term NRC review strategy (Intermediate Milestone 3702002510-014).

Activity 1.5: Analyze regulatory history and intent

CNWRA staff will review pertinent literature and documentary material (e.g. 10 CFR Part 60 and NUREG 0804) to determine history of development and the intent of the NRC with respect to regulatory requirements related to tectonics (Major Milestone 3702002510-015).

Activity 1.6: Develop Technical Review Components

Technical Review Components (TRCs) describe the necessary data, analyses and methods to show that a REOP has been satisfied. CNWRA staff will develop a set of TRCs as directed by the NRC (Intermediate Milestone 3702002510-016).

Activity 1.7: Develop Compliance Determination Methods

CDMs define the methods to be used to determine that Regulatory Elements of Proof and TRCs have been satisfied by the applicant. CDMs must correlate to the REOPs and associated TRCs for each Regulatory Requirement. CNWRA staff will support NRC in development of CDMs within the bounds set by the CDS. Development of analysis codes and methods in Task 3 will support CDM development (Intermediate Milestone 3702002510-017).

Activity 1.8: Identification and analysis of Technical Uncertainties

Technical considerations (Technical Uncertainties and Technical Uncertainty Reduction Methods) that should be assessed in determining compliance with the regulatory requirements will be identified. Information Requirements (IRs) will also be identified where required.

Activity 1.9: Develop and submit Draft Options Report

CNWRA staff will write and submit a Draft Options Report to NRC staff (Major Milestone 3702002520-019). This report will include a discussion of RRs, potential CDMs, technical uncertainties, and uncertainty reduction methods (URMs).

Activity 1.10: Prepare for and conduct CNWRA presentation to NRC staff on Options Paper

CNWRA staff will make an oral presentation of the Options Paper to a group of NRC staff (Intermediate Milestone 3702002520-110).

Activity 1.11: CNWRA presentation to NRC management on Options Paper

CNWRA staff will make an oral presentation of the Options Report to a group of NRC management (Intermediate Milestone 3702002520-111).

Activity 1.12: Develop and submit Final Options Report

(Major Milestone 3702002520-112).

PHASE 2: Determine the Viability of Potential Compliance Determination Methods for Tectonics.

Activity 2.1: Identify existing modeling and analysis methods in tectonics and structural geology

CNWRA staff will review the literature on structural and tectonic analysis for methods and computer codes that may be applicable for use in specific Compliance Determination Methods. Analysis methods and codes currently in use by the DOE will be included in the review. Results from Task 3 activities (ANALYSIS CODES AND METHODS) will be incorporated in this review.

Activity 2.2: Application of selected Task 3 methods and codes

Integrated approaches to data modeling and analysis developed in Task 3 will be examined for application in specific Compliance Determination Methods. The Task 3 activities are intended as prototyping vehicles to test the utility of general modeling methods as regulatory analytical tools. These modeling tools can contribute to effective review and evaluation of alternative tectonic models and alternative conceptual models of complex coupled processes.

In particular, the balanced structural geologic models and the balancing approach developed in Task 3 (PHASE 1) will be tested as evaluation tools where CDMs require the submission of alternative conceptual models by DOE.

PHASE 3: Support NRC Staff in the Development of Prelicensing Regulatory Guidance on Tectonics and in Technical Exchange Interaction.

CNWRA staff will provide support to NRC staff in the development of prelicensing regulatory guidance for tectonics. The CNWRA will assist in the development of

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a comprehensive, well integrated regulatory position on issues related to tectonics. CNWRA staff will provide support to NRC staff in NRC/DOE/Nevada technical exchanges and related meetings on tectonics, as required.

PHASE 4: Develop and Incorporate Detailed SRA Information into PASS Relational Database.

Develop and incorporate detailed information discussing REOPs, TRCs, compliance determination strategies and methods (CDSs and CDMs), uncertainties (UNs), uncertainty reduction methods (URMs) and detailed information requirements (IRs) into the Program Architecture Support System (PASS) relational database. Funding for this phase is not included within this work plan. Deliverables will consist of completion of input into the PASS relational database when funding is provided.

PHASE 5: Integrate Tectonics Regulatory Guidance/Products into the Format and Content Regulatory Guide (F&CRG), and the License Application Review Plan (LARP).

Technical support will be provided for developing aspects of the NRC license application and performance assessment review related to pertinent regulatory requirements. Results will be incorporated into the LARP. This activity is funded as part of supporting development of the LARP in other elements.

III. ESTIMATED LEVEL OF EFFORT

Cost and general scope are included in the CNWRA FY92-93 Operation Plans for the NRC/DHLWM.

IV. SCHEDULE/MILESTONES

The following schedule is dependent on several factors. The duration of review periods and the scope of the required response to address comments may affect revisions of the schedule. Priority reactive work requiring the same staff and expertise may necessitate schedule revisions. Schedule revisions may also result from modifications required in RRs/REOPs based on the resolution of uncertainties concerning the relationships between 10 CFR 60.112 and 10 CFR 60.122. It is anticipated that appropriate staff will be allocated for a joint NRC/CNWRA working group on tectonics. Development and approval of appropriate procedures by the NRC and the CNWRA, and timely acquisition of necessary hardware and software systems will be important in adhering to the schedule.

INTERMEDIATE MILESTONES

WORK ITEM	COMPONENT	TITLE	DATE
510-001	Activity 1.1	Identify pertinent regulatory requirements in 10 CFR Part 60	Oct. 21, 1991
510-013	Activity 1.3	Develop proposed CDS LA Review type (Type 1 - 5) and submit for NRC approval	Feb. 03, 1992
510-014	Activity 1.4	Develop Compliance Determination Strategy	May 04, 1992
510-016	Activity 1.6	Develop Technical Review Components	Aug. 03, 1992
510-017	Activity 1.7	Develop Compliance Determination Methods	Apr. 05, 1993
520-019	Activity 1.9	Develop and submit Draft Options Report	May 17, 1993
520-110	Activity 1.10	Prepare for and conduct CNWRA presentation to NRC staff on Options Paper	Jun. 22, 1993
520-111	Activity 1.11	CNWRA presentation to NRC management on Options Paper	Aug. 03, 1993

MAJOR MILESTONES

WORK ITEM	COMPONENT	TITLE	DATE
510-005	Activity 1.5	Analyze regulatory history and intent	Sept. 30, 1992
510-012	Activity 1.12	Develop and submit Final Options Report	Sept. 30, 1993

V. TECHNICAL CONTACTS

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