

FEB 28 1989

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Dear Dr. Witherspoon:

I am enclosing an abstract for Workshop W3B of the 28th International Geological Congress. If you need any further information, please contact me on 492-3404, or Dr. Justus of my staff on 492-3460.

Sincerely,

**ORIGINAL SIGNED BY**

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

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**U.S. Nuclear Regulatory Commission's Strategy for Identifying and  
Reducing Uncertainties Important to Licensing a High-Level  
Radioactive Waste Repository: Geological Example Applicable  
to the Yucca Mountain Site, Nevada**

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The U.S. Nuclear Regulatory Commission (NRC) staff has prepared a regulatory strategy to guide its High-Level Waste Repository Licensing Program. This strategy consists of approaches for identifying uncertainties in the existing regulatory framework and approaches for further refining the regulatory framework, to reduce uncertainties, using a mix of rulemakings, Technical Positions, and a Regulatory Guide. The resulting refined regulatory framework will help ensure that the U.S. Department of Energy (DOE) submits a complete and high quality License Application and that NRC makes a construction authorization decision within the three-year time period, mandated by the Nuclear Waste Policy Act.

The staff's identification of regulatory, technical, and institutional uncertainties within the existing regulatory framework has been and will be a continuous process. The approaches the NRC staff uses to identify uncertainties include: (1) results of prelicensing technical reviews of DOE's program; (2) results of NRC contractor research; (3) suggestions by DOE, State of Nevada, and other parties; (4) a systematic analysis of the existing regulatory framework; and (5) iterative performance assessments (i.e., computer modeling of repository system performance at the Yucca Mountain site related to compliance with the performance objectives of 10 CFR Part 60).

The staff currently plans to use a variety of approaches to reduce uncertainties. Rulemakings will be the primary mechanism to resolve regulatory uncertainties where the meaning of a requirement or definition in 10 CFR Part 60 is subject to different interpretations or where what is needed to demonstrate compliance with a requirement is not clearly stated in the requirement itself. Rulemakings will be used where authoritative and binding resolution is considered to be needed. Technical Positions may be used where binding resolution is not needed. A Regulatory Guide will be prepared to give guidance on the format and organizational structure for the information to be included in the License Application. Technical Positions will focus primarily on technical uncertainties related to acceptable methods for how compliance should be demonstrated for selected areas that are both controversial and significant to repository performance. These Technical Positions will consist of the criteria that will be guidance to DOE and that the staff will use to

review the methods DOE develops to resolve the technical uncertainties. Both the Technical Position mechanism and the use of criteria (rather than prescribing specific methods) will continue to allow DOE flexibility in its application of state-of-the-art technology to demonstrate compliance. The staff will also use prelicense review and consultation to give guidance to DOE for reducing technical uncertainties.

To the extent practicable, the staff will reduce significant regulatory uncertainties with final rulemakings and Technical Positions by 1992, which is generally when DOE will begin preparing its License Application. Draft Technical Positions and proposed rulemakings, however, will give DOE and other parties an early opportunity to understand and comment on the staff's evolving position. Finally, the process of developing the above-mentioned rulemakings and guidance documents involves all interested parties, including targeted technical groups, so that their questions and concerns can be addressed in an open and documented manner before licensing.

The geological sciences programs/activities of NRC's High-Level Waste Repository Licensing Program are based in the Office of Nuclear Material Safety and Safeguards and the Office of Research. The approximately 20 geoscientists are a portion of the agency's approximately 60 full-time technical staff resources devoted to the High-Level Waste Repository Licensing Program. The geoscientists identify and manage the resolution of regulatory, institutional and technical uncertainties in geology, seismology, geophysics, mineral resources, surface water, groundwater, water resources, climatology, geochemistry and radionuclide transport. Contractor resources are available to support its needs to perform technical analyses and to conduct research that will facilitate uncertainty resolutions. Most of those resources are based at the Center for Nuclear Waste Regulatory Analyses.

The NRC staff anticipates resolving the following geoscience regulatory uncertainties by rulemakings: anticipated processes and events, unanticipated processes and events, groundwater travel time, and the disturbed zone.

The following Technical Positions have been published to assist DOE in addressing various geoscience technical uncertainties: issue-oriented site technical position for Nevada Nuclear Waste Storage Investigation, determination of radionuclide solubility in groundwater for assessment of high-level radionuclide waste isolation, and determination of radionuclide sorption for high-level waste repositories. Technical Positions are under development to guide DOE's resolution of the following technical uncertainties: radionuclide transport, chemical interactions in fractured unsaturated rock, earthquake hazard evaluation, probabilistic seismic hazard analysis, volcanic hazard analysis, natural resources assessment, geologic mapping of shafts and drifts, geomorphic analysis, and scenario identification and screening. Geoscience portions of a Regulatory Guide on the format and content of Site Characterization Plans (SCPs) have been published, and geoscience portions of a Regulatory Guide for the format and content of the License Application are under development.

Preparing rulemaking and Technical Positions helps develop the staff's geoscience review capability. Capability is also developed by preparing plans to review the SCP and study plans, along with developing assessment methods, models and computer codes to be applied to the review of DOE's program. For example, the staff is participating in INTRAVAL exercises.

NRC will soon issue its analysis of the SCP (the report is the Site Characterization Analysis, SCA). The objections, comments, or questions and related recommendations that the NRC presents in the SCA will be entered in an open item tracking system such that progress toward closure of those items with DOE can be followed by any interested party. Examples of geoscience-oriented concerns from the Consultation Draft SCP will be discussed in the paper and presented at the workshop, as time allows. Subjects will focus on the Exploratory Shaft Facility, EPA standard (60.112), performance objectives (60.113) and siting criteria (60.122).

It is the mission of the NRC to assure that DOE constructs and operates the HLW repository without unreasonable risk to the public health and safety. Early NRC identification of geoscience uncertainties at the Yucca Mountain candidate site and working with DOE toward their resolution should contribute to the successful completion of that mission and perhaps lead to the ultimate objective: ensuring that, in this first-of-a-kind waste disposal program, the job is done right the first time.