

May 21, 2002

Joseph D. Ziegler, Acting Assistant Manager
Office of Licensing and Regulatory Compliance
U.S. Department of Energy
Yucca Mountain Site Characterization Office
P.O. Box 364629
North Las Vegas, NV 89036-8629

SUBJECT: STRUCTURAL DEFORMATION AND SEISMICITY KEY TECHNICAL ISSUE
AGREEMENT

Dear Mr. Ziegler:

During a Technical Exchange and Management Meeting held on October 11-12, 2000, the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Department of Energy (DOE) reached agreement on a number of issues within the Structural Deformation and Seismicity (SDS) Key Technical Issue (KTI). By letter dated September 18, 2001, DOE provided information pertaining to SDS Agreement 3.01. The NRC staff has reviewed this information as it relates to the agreement and the results of the staff's review are enclosed.

In summary, based on the information reviewed and interactions between the NRC and DOE, it is not apparent that observed fracture-fault patterns and lithostratigraphic information were used in the Alcove 8 Niche 3 hydrologic and transport test design and modeling. The NRC staff believes that fracture patterns and other geologic information are important in helping to understand results of tests conducted in niches, alcoves, and the sealed cross-drift. Therefore, the NRC staff requests the documentation to show how, or the methodology to ensure that, these tests were or will be interpreted with respect to local fracture-fault patterns and lithostratigraphic information. Because SDS Agreement 3.01 still requires DOE to provide information for the sealed cross-drift and Alcove 8 Niche 3 tests, this agreement will be listed as "Partly Received."

If you have any questions regarding this letter, please contact Mr. James Andersen of my staff. He can be reached at (301) 415-5717.

Sincerely,
/RA/

Janet Schlueter, Chief
High-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated
cc: See attached distribution list

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Letter to S. Brocoum from J. Schlueter dated: May 21, 2002

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NRC Review of DOE Documents Pertaining to Key Technical Issue Agreements

The U.S. Nuclear Regulatory Commission (NRC) goal of issue resolution during this interim pre-licensing period is to assure that the U.S. Department of Energy (DOE) has assembled enough information on a given issue for NRC to accept a license application for review. Resolution by the NRC staff during pre-licensing does not prevent anyone from raising any issue for NRC consideration during the licensing proceedings. Also, and just as importantly, resolution by the NRC staff during pre-licensing does not prejudge what the NRC staff evaluation of that issue will be after it's licensing review. Issues are resolved by the NRC staff during pre-licensing when the staff has no further questions or comments about how DOE is addressing an issue. Pertinent new information could raise new questions or comments on a previously resolved issue.

This enclosure addresses one agreement between the NRC and DOE made during the Structural Deformation and Seismicity (SDS) Technical Exchange and Management Meeting (see NRC letter dated October 27, 2000, which summarized the meeting). By letter dated September 18, 2001, DOE submitted information to address SDS Agreement 3.01. The information submitted for this agreement is discussed below:

1) Structural Deformation and Seismicity Agreement 3.01

Wording of the Agreement: The Enhanced Characterization of the Repository Block (ECRB) long-term test and the Alcove 8 Niche 3 test need to be "fracture-informed" (i.e., observation of seepage needs to be related to observed fracture patterns). Provide documentation which discusses this aspect. DOE responded that for the passive test, any observed seepage will be related to full periphery maps and other fracture data in testing documentation. The documentation will be available by any potential license application (LA). For Niche 3, fracture characterization is complete and a three-dimensional (3-D) representation will be included in testing documentation. The documentation will be available August 2001.

NRC Review: During the October 11-13, 2000 technical exchange, the NRC staff expressed concern that geologic information used in DOE hydrologic models was not consistent with observed fracture patterns and other geologic information. The mutually agreed upon intent of SDS Agreement 3.01 was that DOE would provide documentation to show that the observed fracture-fault patterns and lithostratigraphic information was adequately captured in the hydrologic models associated with the passive and Alcove 8 Niche 3 tests. The NRC used the term "fracture-informed" to try to express this idea.

By letter dated September 18, 2001, DOE provided a 3-D depiction of fractures between Alcove 8 and Niche 3. The 3-D depiction of fractures between Alcove 8 and Niche 3 was also discussed during an October 2001 Appendix 7 meeting with DOE. During the Appendix 7 meeting, the NRC staff requested additional information concerning the development of the 3-D depiction. Subsequently, DOE provided the NRC staff with a document dated November 19, 2001¹, which described the DOE methodology for developing the 3-D depiction.

In SDS Agreement 3.01, the DOE stated that for Niche 3, fracture characterization was complete and that a 3-D representation would be included in testing documentation of that test. However, the 3-D depiction was transmitted by itself without testing documentation. The staff

¹N.H.Williams, Bectel SAIC Company, Inc., to S.J. Brocum, U.S. Department of Energy, November 19, 2001

reviewed the Alcove 8 Niche 3 Pre-test Prediction Report² and observed that the fracture information compiled for the 3-D depiction was different from that cited in the Pre-test Prediction Report. Moreover, at the October 2001 Appendix 7 meeting it was recognized by DOE and NRC participants that the 3-D depiction model was not considered for the Phase 1 testing, or for the planned Phase 2 investigations in the Alcove 8 Niche 3 test. Thus, it is not apparent to the NRC staff that observed fracture-fault patterns and lithostratigraphic information were used in the Alcove 8 Niche 3 hydrologic and transport test design and modeling. In addition, at the Appendix 7 meeting, DOE made no commitment to use the 3-D depiction, as it was presented.

The NRC staff believes that fracture patterns and other geologic information are important in helping to understand results of hydrologic and transport tests conducted in niches, alcoves, and the sealed cross-drift. Therefore, the NRC staff requests the documentation to show how, or the methodology to ensure that, these tests were or will be interpreted with respect to local fracture-fault patterns and lithostratigraphic information.

The following would be the staff's general comments on the 3-D depiction, if the depiction as presented, would be used for fracture-informing the Alcove 8 Niche 3 hydrologic and transport tests: (1) provide the actual sources of fracture, fault and lithostratigraphic data considered (i.e., maps and measurements of geologic features exposed in the alcove, niche and adjacent drift walls, in addition to the tomographic data and interpretations provided) and parameter values used to develop the depiction; (2) explain the bases for selecting/abstracting the parameters/ranges of parameters used and resulting uncertainties (e.g., trace lengths, fracture and fault shape, density, connectivity, orientation of joint sets, distribution of fractures and their structural relationship to the fault, stratigraphic unit boundaries); (3) explain the bases for all assumptions made, especially if they might bear on interpretations, or on the need for quantification - a case in point is assumption 4 - the apparently high connectivity does not imply high porosity or high permeability, and fracture aperture is not considered in the depiction; (4) explain the modeling method, attendant uncertainties and how uncertainties were treated or reflected in the depiction (e.g., the benefits and limitations of AutoCAD 14 and the method of populating the model volume with fractures); (5) explain and document for users of the fracture-fault conceptual model (e.g., flow and transport investigators and modelers) how the 3-D depiction can be used to estimate flow and transport model parameter values, ranges and distributions, for example fracture spacing, fracture porosity, and others as needed, including its limitations and resulting uncertainties; and (6) address the future issues of scaling the test volume and the extrapolation of test results to other parts of the repository, from the structural-geologic and stratigraphic framework viewpoints, and how scaling and extrapolation issues will be applied to hydrologic and transport modeling.

DOE should consider the above NRC comments, as well as the staff's comments in response to SDS Agreement 3.02 and Radionuclide Transport (RT) Agreement 3.06³, when it addresses SDS Agreements 3.01 and 3.02, and RT Agreement 3.06. Because SDS Agreement 3.01 still requires DOE to provide information for the ECRB long-term and Alcove 8 Niche 3 tests, this agreement will be listed as "Partly Received."

Additional Information Needed: The NRC staff requests the documentation to show how, or the methodology to ensure that, actual or expected hydrologic and transport test results were or will be interpreted in light of fracture-fault patterns and lithostratigraphic information in the test volume vicinity.

Status of Agreement: SDS Agreement 3.01 is "Partly Received."

²S.J. Brocoum, U.S. Department of Energy, letter to C.W. Reamer, U.S. Nuclear Regulatory Commission, March 12, 2001

³C.W.Reamer, U.S. Nuclear Regulatory Commission, letter to S.J. Brocoum, U.S. Department of Energy, February 6, 2002