

August 29, 2001

Dr. Stephan Brocoum, Assistant Manager
Office of Licensing and Regulatory Compliance
U.S. Department of Energy
Office of Civilian Radioactive Waste Management
Yucca Mountain Site Characterization Office
P.O. Box 30307
North Las Vegas, NV 89036-0307

SUBJECT: THERMAL EFFECTS ON FLOW AGREEMENTS

Dear Dr. Brocoum:

During the Thermal Effects on Flow (TEF) Technical Exchange and Management Meeting held on January 8-9, 2001, the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Department of Energy (DOE) reached 15 agreements pertaining to the TEF Key Technical Issue (KTI). By letters dated February 2, March 2, March 22, April 13, and April 30, 2001, DOE provided several documents pertaining to NRC/DOE agreements, including 16 documents pertaining to TEF agreements. The NRC has reviewed these documents and the results of its review are enclosed.

Based on its review, the NRC believes that TEF Agreements 1.01, 1.02, and 2.02 can be listed as complete. As agreed to in TEF Agreement 2.01, the staff is providing its comments on the DOE White Paper associated with the Drift-Scale Test (see Attachment 1 to the Enclosure). The NRC plans to keep TEF Agreement 2.01 listed as partly received until DOE responds to the NRC comments, as required by the agreement. Regarding TEF Agreements 2.03, 2.07, and 2.12, the NRC plans to keep these agreements listed as partly received until DOE provides the remaining agreed upon documents.

In addition, during the TEF technical exchange, the NRC stated that it would review the Draft Cross Drift Thermal Test Planning Report and provide DOE with comments, if any. The NRC has completed its review and its comments on the report are contained in Attachment 2 to the Enclosure.

S. Brocoum

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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/

C. William Reamer, 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 C.W. Reamer dated: August 29, 2001

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NRC Review of DOE Documents Pertaining to Thermal Effects on Flow 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 its 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 several NRC/DOE agreements made during the Thermal Effects on Flow (TEF) Technical Exchange and Management Meeting on January 8-9, 2001 (see letter dated January 26, 2001, "U.S. Nuclear Regulatory Commission/U.S. Department of Energy Technical Exchange and Management Meeting on Thermal Effects on Flow (January 8 through 9, 2001)" which summarized the meeting). By letters dated February 2, March 2, March 22, April 13, and April 30, 2001, DOE submitted 16 documents to address 7 of the TEF agreements. The documents submitted and associated KTI agreements are discussed below:

1) TEF Agreement 1.01

Wording of the Agreement: Provide the FEPs [Features, Events, and Processes] AMRs [Analysis and Model Reports] relating to TEF. The DOE will provide the following updated FEPs AMRs related to thermal effects on flow to the NRC: *Disruptive Events FEPs* (ANL-NBS-MD-000005) Rev 00 ICN 01; *Features, Events, and Processes: System Level* (ANL-WIS-MD-000019) Rev 00; *Features, Events, and Processes in UZ Flow and Transport* (ANL-NBS-MD-000001) Rev 01; *Features, Events, and Processes in SZ Flow and Transport* (ANL-NBS-MD-000002) Rev 01; *Features, Events, and Processes in Thermal Hydrology and Coupled Processes* (ANL-NBS-MD-000004) Rev 00 ICN 01; *Miscellaneous Waste Form FEPs* (ANL-WIS-MD-000009) Rev 00 ICN 01; and *Engineered Barrier System Features, Events, and Processes* (ANL-WIS-PA-000002) Rev 01. Expected availability: January 2001.

NRC Review: The NRC reviewed the seven documents as they pertain to this agreement. These FEPs documents were discussed during the two Total System Performance Assessment and Integration (TSPAI) technical exchanges held in May and August 2001. During these technical exchanges, the NRC and DOE reached a number of separate agreements pertaining to FEPs (see TSPAI Agreements 2.01 to 2.04). With these specific TSPAI agreements in place, the NRC believes this agreement can be listed as complete.

Additional Information Needed: Resolution of TEF Subissue 1 depends on the satisfactory resolution of the TEF portion of TSPAI Agreements 2.01 through 2.04.

Status of Agreement: TEF Agreement 1.01 has been superceded by TSPAI Agreements 2.01 through 2.04. TEF Agreement 1.01 is complete.

2) TEF Agreement 1.02

Wording of the Agreement: Provide the FEPs database. The DOE will provide the FEPs data base to the NRC during March 2001.

Enclosure

NRC Review: The NRC reviewed the FEPs database as it pertains to this agreement. The FEPs database was discussed during the two TSPAI technical exchanges held in May and August 2001. During these technical exchanges, the NRC and DOE reached a number of separate agreements pertaining to FEPs (see TSPAI Agreements 2.01 to 2.04). With these specific TSPAI agreements in place, the NRC believes this agreement can be listed as complete.

Additional Information Needed: Resolution of TEF Subissue 1 depends on the satisfactory resolution of the TEF portion of TSPAI Agreements 2.01 through 2.04.

Status of Agreement: TEF Agreement 1.02 has been superseded by TSPAI Agreements 2.01 through 2.04. TEF Agreement 1.02 is complete.

3) TEF Agreement 2.01

Wording of the Agreement: Consider measuring losses of mass and energy through the bulkhead of the drift-scale test (DST) and provide the technical basis for any decision or method decided upon (include the intended use of the results of the DST such as verifying assumptions in FEP exclusion arguments or providing support for TSPA [total system performance assessment] models. The DOE should analyze uncertainty in the fate of thermally mobilized water in the DST and evaluate the effect this uncertainty has on conclusions drawn from the DST results. The DOE's position is that measuring mass and energy losses through the bulkhead of the DST is not necessary for the intended use of the DST results. The DST results are intended for validation of models of thermally-driven coupled processes in the rock, and measurements are not directly incorporated into TSPA models. Results of the last two years of data support the validation of DST coupled-process models and the current treatment of mass and energy loss through the bulkhead. The DOE will provide the NRC a white paper on the technical basis for the DOE's understanding of heat and mass losses through the bulkhead and their effects on the results by April 2001. This white paper will include the DOE's technical basis for its decision regarding measurements of heat and mass losses through the DST bulkhead. This white paper will address uncertainty in the fate of thermally mobilized water in the DST and also the effect this uncertainty has on conclusions drawn from the DST results. The NRC will provide comments on this white paper. The DOE will provide analyses of the effects of this uncertainty on the uses of the DST in response to NRC comments.

NRC Review: The NRC has reviewed the document entitled "Heat and Mass Flow Through the Bulkhead in the Drift Scale Test - White Paper" as it pertains to this agreement. The NRC comments on this paper are provided in Attachment 1 to this Enclosure. Because the agreement also states that "DOE will provide analyses of the effects of this uncertainty on the uses of the DST in response to NRC comments," the NRC plans to keep this agreement listed as partly received until DOE responds to the NRC comments.

Additional Information Needed: None at this time.

Status of Agreement: TEF Agreement 2.01 is partly received.

4) TEF Agreement 2.02

Wording of the Agreement: Provide the location and access to the Multi-Scale Thermohydrologic Model input and output files. The output files are in the Technical Data Management System. The DTNs [data tracking numbers] are LL000509112312.003, LL000509012312.002, and LL000509212312.004. The input files are located in the Project

records system. The document identification number is MOL.20000706.0396. The DOE will provide the requested information to the NRC in January 2001.

NRC Review: DOE provided the data files in letters dated February 2 and March 2, 2001. The NRC has reviewed the data files and believes they satisfy the intent of the agreement. The NRC notes that it continues to work with DOE on problems encountered in trying to obtain data from the Technical Data Management System. Progress has been made in obtaining the data from NRC headquarters, but some problems continue to exist when trying to obtain data from the Center for Nuclear Waste Regulatory Analyses (Center) in San Antonio, Texas.

Additional Information Needed: None at this time

Status of Agreement: TEF Agreement 2.02 is complete.

5) TEF Agreement 2.03

Wording of the Agreement: Provide the following references: Multi-Scale Thermohydrologic Model AMR, ICN 01; Abstraction of Near Field Environment Drift Thermodynamic and Percolation Flux AMR, ICN 01; Engineered Barrier System Degradation Flow and Transport PMR [Process Model Report], Rev. 01; and Near Field Environment PMR, ICN 03. DOE will provide to the NRC the following documents: *Multi-Scale Thermohydrologic Model* AMR (ANL-EBS-MD-00049) Rev 00 ICN 01 (January 2001), *Abstraction of Near-Field Environment Drift Thermodynamic and Percolation Flux* AMR (ANL-EBS-HS-000003) Rev 00 ICN 01 (January 2001), *Engineered Barrier System Degradation, Flow and Transport* PMR (TDR-EBS-MD-000006) Rev 01 (September 2001), and *Near-Field Environment* PMR (TDR-NBS-MD-000001) Rev 00 ICN 03 (January 2001).

NRC Review: The NRC has reviewed the Multi-Scale Thermohydrologic Model AMR, Abstraction of Near Field Environment Drift Thermodynamic and Percolation Flux AMR, and Near Field Environment PMR, and believe that no additional information is needed at this time. The NRC notes that one additional document (the Engineered Barrier System Degradation Flow and Transport PMR) is needed related to this agreement and, therefore, plans to continue to list this agreement as partly received.

Additional Information Needed: None at this time.

Status of Agreement: TEF Agreement 2.03 is partly received.

6) TEF Agreement 2.07

Purpose of the Documents: Provide the Ventilation Model AMR, Rev. 01 and the Pre-Test Predictions for Ventilation Test Calculation, Rev. 00. The DOE will provide the *Ventilation Model* AMR (ANL-EBS-MD-000030) Rev 01 to the NRC in March 2001. Note that ventilation test data will not be incorporated in the AMR until FY02. The DOE will provide the Pre-test Predictions for Ventilation Tests (CAL-EBS-MD-000013) Rev 00 to the NRC in February 2001. Test results will be provided in an update to the *Ventilation Model* AMR (ANL-EBS-MD-000030) in FY 02.

NRC Review: The NRC has reviewed the pre-test predictions for the ventilation test and believe that no additional information is needed at this time. The NRC notes that the next two revisions of the Ventilation Model AMR are needed related to this agreement and, therefore, plans to continue to list this agreement as partly received.

Additional Information Needed: None at this time.

Status of Agreement: TEF Agreement 2.07 is partly received.

7) TEF Agreement 2.12

Purpose of the Documents: Provide the Unsaturated Zone Flow and Transport PMR, Rev. 00, ICN 02, documenting the resolution of issues on page 5 of the OI 8 presentation. The DOE will provide the *Unsaturated Zone Flow and Transport* PMR (TDR-NBS-HS-000002) Rev 00 ICN 02 to the NRC in February 2001. It should be noted, however, that not all of the items listed on page 5 of the DOE's Open Item 8 presentation at this meeting are included in that revision. The DOE will include all the items listed on page 5 of the DOE's Open Item 8 presentation in Revision 02 of the *Unsaturated Zone Flow and Transport* PMR, scheduled to be available in FY 02.

NRC Review: The NRC staff has reviewed Revision 00, ICN 02 of the Unsaturated Zone Flow and Transport PMR and believes that no additional information is needed at this time. The NRC notes that Revision 00, ICN 02 does not contain the information discussed in the agreement, specifically, that DOE address the "resolution of issues on page 5 of the OI [open item] 8 presentation" from the January 2001 technical exchange. Therefore, the NRC plans to continue to list this agreement as partly received.

Additional Information Needed: None at this time.

Status of Agreement: TEF Agreement 2.12 is partly received.

8) Draft Cross Drift Thermal Test Planning Report

During the TEF technical exchange, the NRC stated that it would review the Draft Cross Drift Thermal Test Planning Report and provide DOE with comments, if any. The NRC has completed its review and its comments on the report are contained in Attachment 2 to this Enclosure.

Attachment 1: Comments on White Paper: Heat and Mass Flow Through the Bulkhead in the Drift-Scale Test

Attachment 2: Comments on the Draft Cross Drift Thermal Test Planning Report