



AGENCY FOR NUCLEAR PROJECTS
NUCLEAR WASTE PROJECT OFFICE

Capitol Complex
Carson City, Nevada 89710
Telephone: (702) 687-3744
Fax: (702) 687-5277

September 16, 1991

John J. Linehan, Acting Director
Repository Licensing and Quality
Assurance Project Directorate
Division of High-Level Waste Management
Office of Nuclear Material Safety
and Safeguards
United States Nuclear Regulatory Commission
Washington, D.C. 20555

RE: DRAFT (JUNE 1991) STAFF TECHNICAL POSITION ON "GEOLOGIC
REPOSITORY OPERATIONS AREA UNDERGROUND FACILITY DESIGN --
THERMAL LOADS"

Dear Mr. Linehan:

The Nevada Agency for Nuclear Projects Nuclear Waste Project Office has reviewed the subject Staff Draft Technical Position (STP). We have a number of comments which we offer for your consideration in further development of this STP. Our general comments are included in this letter, and specific comments are contained in the attachment to this letter.

General Comments:

The STP is a generic, non-technical document which, based upon a flow-diagram, discusses and recommends an iterative procedure for demonstrating compliance of the underground repository facility with the requirements pertaining to thermal loads as they appear in applicable portions of 10 CFR Part 60 regulations. There is no indication of when this iterative process should be initiated, since there is little reference to the process of site characterization or of what kinds and levels of data are expected to be derived from site characterization for use in the procedure developed in this STP. This is of more than passing importance since the DOE is planning that the exploratory shaft (now studies) facility be incorporated into the underground repository facility

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and it is already in the design process without benefit of the considerations outlined in the STP.

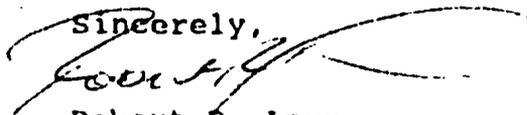
The DOE's assumption appears to be that thermal loading can be backfit to any repository design, which is an approach opposite to that advanced in the STP. This is important in the context of this STP since implicit in the DOE assumption is the notion that thermal loading is a design feature of an underground repository facility, rather than a potential adverse impact that has waste isolation implications, as appears to be the case in the STP. If it is to be treated as a design feature, then the NRC, in its STP, should be concerned also with the design basis of the selected magnitude and rate of thermal loading and should require that the selection be supported by a thorough evaluation of alternative loads and their consequences for waste isolation performance. These incompatible views of the role of thermal loading in a repository must be reconciled before further development of a thermal load STP is undertaken.

The STP is based on the premise that performance assessment models for the evaluation of compliance with the performance objectives of 10 CFR Part 60 will exist at the time of license application. The suggested iterative process involves the use of increasingly advanced models, which are referred to as fully, partially, or one-way coupled thermal-mechanical-hydrological-chemical (T-M-H-C) models. These are inadequately defined in the STP in regard to their underlying assumptions and the kinds and levels of information needed for their acceptable application. This leads to what appears to be an endorsement of the use of expert judgement when either the data base is insufficient or the iterative process fails to resolve an issue.

In general, the STP lacks sufficient technical specificity to determine whether the suggested methodology is feasible for implementation, but more important, the suggested methodology is not compatible with the ongoing implementation of the DOE site characterization program, and therefore likely will be of little use as guidance to DOE.

We appreciate the opportunity to review this Staff Draft Technical Position, and are available to discuss these comments further should you find it necessary.

Sincerely,



Robert R. Loux
Executive Director

RRL/cs
attachment
cc: John Bartlett, OCRWM

Carl Gertz, YMPO
Don Deere, NWTRB
Dade Moeller, NRC, ACNW
Dwayne Weigel, GAO
Steve Kraft, EEI

ATTACHMENT

Nevada Agency for Nuclear Projects
Nuclear Waste Project Office

DRAFT (JUNE 1991) TECHNICAL POSITION ON "GEOLOGIC REPOSITORY
OPERATIONS AREA UNDERGROUND FACILITY DESIGN -- THERMAL LOADS"

Specific Comments:

1. Page 1, par. 1.

It is emphasized in the STP that the DOE is expected to demonstrate a comprehensive, systematic and logical understanding of T-M-H-C of the underground facility. This should be elaborated. It is not clear how such demonstration is expected to be accomplished, and whether both the theoretical and site-specific basis for such understanding should be presented.

2. Page 2, par. 1.

The STP states: "The staff expects that, through the pursuit of appropriate technical programs, DOE would develop information that would enhance considerably the approach in this document."

This presumes that DOE will choose to adhere to the staff approach (see general comments), and if DOE does so choose, the statement suggests that the staff has some doubts about whether the approach as presented will lead to an adequate determination of compliance. If such doubts exist, the staff itself should attempt to enhance the approach before it is reissued as information and guidance.

3. Page 2, par. 2.

The STP states: "In this STP, the NRC assumes that performance assessment models will exist for evaluating compliance with 10 CFR Part 60 performance objectives."

See discussion of this assumption in general comments.

4. Page 2, par. 2.

The STP states: "However, elaboration on the specifics of performance assessments, with respect to the individual 10 CFR Part 60 performance objectives, is outside the scope of this STP."

Some elaboration would be helpful in this STP in order to expose at least some of what the staff believes is appropriate for data collection and analysis during site characterization. This could result in a beneficial reduction in uncertainty in the thermal loading assessment in a license application, since the STP appears

to expect that uncertainties will be relatively large at the time of license application, and will reduce significantly during construction and operation.

5. Page 4, par. 1.

The STP states: "the guidance in the STP focuses on the prediction of repository-generated thermal regimes beyond the range of current engineering experience."

"Current engineering experience" should be elaborated in this section in order to better understand the focus of this STP. Is there "current engineering experience" that the staff believes is relevant under the range of thermal load scenarios that the DOE is likely to consider, given the repository development and operation schedule it is attempting to meet?

6. Page 5, par. 2.

The STP states: "If there is an unresolved safety question relating to model validation, this could be described in the application and need not stand in the way of issuance of a construction authorization (so long as there is reasonable assurance of safety)."

The word "could " should be replaced by "should." If there is an unresolved safety question relating to model validation, the standard of reasonable assurance will be diminished unnecessarily to some extent if the issues involved in the lack of resolution are not described.

7. Page 8, par. 2:

Step No. 1 calls for a preliminary evaluation of the sensitivity of the performance objectives to thermal loading.

The STP should outline the type and level of data and the maturity of facility design necessary to make this evaluation since the Step 1 determination, according the STP approach, may never be revisited.

8. Page 8, par. 3.

Step No. 2 calls for the determination of the existence of predictive models to quantify the effect of thermal loadings.

This step should require, in addition, a demonstration of the reliability of such models relative to the specific site being evaluated by DOE. According to the STP approach, this determination may never be revisited.

9. Page 8, par.4.

Step No. 3 calls for an examination of the thermally induced phenomena.

The STP should outline the type and level of data necessary for this examination, and should elaborate on what methods and scope of examination might be expected to be employed.

10. Page 8, par. 5.

Step No. 4 calls for development of design goals/criteria.

In such development, the STP should call for an evaluation of alternative design goals/criteria based on varying the magnitude and rate of thermal loading. The basis for the design goals/criteria selected should be demonstrated.

11. Page 9, par 6.

The STP states: "If, after numerous design iterations, noncompliance with 10 CFR part 60 performance objectives persists, examination of other criteria not related to the underground facility design should be considered (Step No. 8B)."

This step suggests that the "other" engineering criteria have been set independent of thermal load considerations and their relationship to thermal loading need not be considered except as a means of compensating for unresolvable problems in performance of the underground facility and its design. It should not be acceptable that the underground facility design be considered the "weak link" in performance relative to thermal loads.

12. Page 10, par. 3.

The STP states: "Develop models that approximate fully coupled behavior in a manner that is not likely to adversely affect the performance objectives..."

This could be stated more clearly. Performance objectives are not affected by behavior.

The STP should provide some guidance on the intended bounds of such an approximation, and the type and level of data necessary to make and demonstrate such an approximation.

13. Page 17, par. 2.

The STP states: "If unacceptable results are encountered, it may become necessary to return to Step No. 3, from Step No. 8 (see Figure 1)."

If there is continued noncompliance, then disqualification of the site should be considered also.

14. Page 17, par. 3.

The STP states: "In this case, a decision would be made to look for problems related to waste package design, borehole, and shaft seals design, and/or geologic setting concerns (Step No. 8B); however, discussions of such analyses are beyond the scope of this STP."

See comment 11 above.

15. Page 19, par. 1.

The STP states: "The analyst should choose a model that strikes a balance between workable detail and oversimplification of the processes that are being modeled. Such a balance can reduce the model uncertainty to a degree. Nevertheless, there remains residual model uncertainty that results from the simplification and lack of knowledge of the phenomenon being modeled."

This statement alone does not provide useful information or guidance. It suggests that the analyst is encouraged to use his expert judgement as to what represents the proper balance, but it does not specifically require that there be a demonstration of the extent to which a lack of knowledge contributes to the balance.

16. Page 34, par. 2.

The STP states: The order in which the phenomena (e.g. thermal, mechanical, hydrological, or chemical) are analyzed in Figure C1 is shown only as an example. The responsibility to determine the most appropriate sequence of analyses rests with the licensee."

The STP should require that alternative orders of consideration be evaluated and that the basis for selection be demonstrated. Further, by using the word licensee, the suggestion is that this exercise is not one which is to be carried out prior to license application. Surely this is not intended by the staff.

17. Page 34, par. 3.

Regarding the use of "licensee", see comment 16 above.