426.1/KCC/84/03/07/0

MAR 15 1984

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Mr. Allen G. Croff
Engineering Analysis and Planning
Chemical Technology Division
Oak Ridge National Laboratory
P.O. Box X
Oak Ridge, TN 37831

Dear Mr. Croff:

We have reviewed ORNL's January report for FIN B-0288. We are satisfied with the progress reported and have no comments.

We have also reviewed the first complete draft of the "Draft Staff Technical Position of Repository Environmental Parameters Relevant to Assessing the Performance of HLW Packages." Our comments are presented as follows:

General Comments:

1. The emphasis of the document should be changed to highlight:

   (a) the specification for a model that will predict the significant environmental parameters, including specific input and output information

   (b) the specific criteria that NRC can use to evaluate the analytical method used in the model.

   Discussion of the approach to be used by DOE in developing the model should be deemphasized.

2. Alter the tone of the document so that it is more consistent with a Technical Position, i.e., provide guidance on information needed to meet 10 CFR Part 60 rather than on how to develop the information.

3. This DTP should be consistent with other pertinent DTP's (e.g., NUREG-856 on computer codes; NUREG-0997 on waste package reliability; and NUREG/CR-3219 on waste package performance after repository closure). If this cannot be done, the differences should be stated as well as the rationale for the new position.

4. Review the assumptions stated in the DTP and try to avoid any that are so restrictive as to give the appearance of endorsing specific techniques.

Specific comments are presented in Enclosure 1.

OFC	WMEG	WMEG					
NAME	KCChang:lcs	EAWick					
DATE	3/ /84	3/ /84					

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The comments we have provided above are expected to result in considerable changes to the DTP. Please incorporate all the changes which you have information on before May 15, 1984 and discuss with me those changes which you feel cannot be made by this date.

The action taken by this letter is considered to be within the scope of the current contract FIN B-0288. Please notify me immediately if you believe this letter would result in changes to costs or delivery of contracted products.

Sincerely,

Kien C. Chang
Engineering Branch
Division of Waste Management

Enclosure:
As stated

OFC	WMEG	WMEG				
NAME	KCChang:lcs	EAWick				
DATE	3/14/84	3/15/84				

NRC Specific Comments on DTP,
"Repository Environmental Parameters Relevant to
Assessing the Performance of HLW Packages"

1. Change title to read "Draft Technical Position on Repository Environmental Parameters Relevant to Assessing the Performance of HLW Packages."

2. P. iii, 1.2-2, Section 60.133(a)(ii)(A) should be Section 60.113(a)(ii)(A).

3. P. iii, Title of Chapter 2. "NLW" should be "HLW."

Chapter 1

1. Retain Chapter 1, but revise it to reflect the suggestions stated in "general comments" of this letter.

2. Rewrite Section 1.1, Purpose and Scope to define specifically what this DTP is trying to do ... (1) to generate specifications on repository environmental parameters affecting waste package performance, (2) types of models and methods acceptable for determining these parameters, and (3) types of data and information, both input and output, expected when using these models or methods.

3. Stress in the specification what information is needed and why in terms of meeting waste package specific performance criteria from a repository parameter viewpoint. De-emphasize how it should be done; leave that to DOE's engineering/scientific judgement as there may be more than one way that is acceptable.

4. Rewrite Section 1.2, Regulatory Perspective to concentrate discussion on repository environmental paramenters affecting waste package containment lifetime and release rate criteria. Section 1.2.4 is on the right track.

5. Rewrite Section 1.3, Technical Perspective in a more direct manner. State objectives in terms of what is within the scope of this DTP rather than that which is outside the scope of the DTP.

6. Clarify the discussion (page 1-6) on the waste package as providing "a major basis for compliance in cases involving intermediate times and distances..."

7. Revise Figure 1. As written, it describes an assumed overall package analysis approach that may not be used by DOE. If a flow chart is left in Chapter 1, it should be more general and should put the importance of the environmental parameters in perspective without specifying details regarding how DOE should use the information. Use phraseology such as:

   > "Performance criteria may be met by several approaches to models/methodology. An example of one approach is provided in Figure 1."

   Fault treees/event trees should be mentioned as one technique of risk assessment that may be considered (but not necessarily the only acceptable technique).

8. Add a section to discuss how the design criteria factors in 10 CFR 60.135 must be addressed in evaluating the adequacy of the waste package design.

Specific Comments on Chapter 1

1. P. 1-1. Add items (d) and (e) to the purpose of these specifications "(d) The possible use by DOE of models to allocate contribution of containment by the individual waste package components" and "(e) the identification of controllable parameters and the degree of control attainable.

2. P. 1-2, last paragraph, 1st sentence. Change "a minimum set of requirements" to "guidance".

3. P. 1-2 last paragraph, last sentence. Rewrite this sentence to state "requirements of this DTP" as "attributes of the guidance provided by this DTP".

4. P. 1-3, 9th line from the top. Delete the words "and approach".

5. P. 1-3, item (7). Change "The details of an acceptable approach" to "the details of acceptable methods".

6. P. 1-6, 1st paragraph, 2nd sentence. This sentence states the anticipation of this DTP on the use of waste package containment for satisfaction of the EPA standard. Please change this to state that it is an option for DOE to take this approach. Quantify "intermediate times and distances".

7. P. 1-6, 2nd paragraph. In referring to part 40 CFR 191 §191.14 on radionuclide release over 10,000 year time frame, please state that it is not likely that NRC will give 10,000 year containment credit to the waste package.

8. P. 1-6, Title of Section 1.2.2. Change Section 60.133 to Section 60.113.

9. P. 1-6, Section 1.2.2, third line of paragraph. Change the word "withing" to "within".

10. P. 1-8A. The fault/event tree analysis is a methodology which DOE may or may not use in their performance analysis. This figure describes a waste package performance analysis system which may not be chosen by DOE. We suggest that this figure be changed so that it does not restrict DOE to specific methodology.

11. P. 1-9, §1.3.2.1, item 2. The stepwise approach in this section is not necessary. We suggest changing this to read "the system approach must evaluate component function through time." This will not restrict the use of methods using a non-step-wise approach.

12. P. 1-10, item 4. It is inappropriate to speculate on future policy changes. Change this paragraph to state that at present, to satisfy both 10 CFR 60 and 40 CFR 191, the 10,000 year basis for EPA regulation requires an analysis to a duration of 10,000 years, even though it is not likely that NRC will credit a claim of 10,000 years containment by the waste package.

13. P. 1-10, item 5. This item restricts the approach to "time steps." We suggest the subtitle be changed to read "The system will be designed to account for interaction of degradation processes through time."

14. P. 1-12, §1.3.2.5. See items (11) and (13) on step-wise time assumption.

Chapter 2

1. Eliminate Chapter 2 as a separate entity, but transfer to Chapter 3 (Specifications) the parts of Chapter 2 that should be retained, e.g., model validation, use of experimental results for input parameters, use of Probability Distribution Functions (PDF). Reference "Final Technical Position on Documentation of Computer Codes for High-Level Waste Management," NUREG-0856, June 1983 in the specifications.

2. Delete any assumption of "deterministic models" (pages 2-3 and 2-4).

3. Add sections to discuss uncertainty and accuracy of input/output data and reliability of methods. (Reference DTP on Waste Package Reliability, NUREG-0997, September 1983).

Specific Comments on Chapter 2

1. P. 2-4, Section 2.1.2.3, 4th sentence. The probability density function represents an estimate of the experimental results discussed. This portion of the section states that "some portions of the PDF need not meet this qualification" of not being non-conservative. This would be in conflict with the content of 10 CFR 60.135(a). Therefore, if portions of the PDF do not meet the "not being non-conservative" concept, the degree of non-conservativeness must be estimated to show that failing to meet the qualification by those portions of the PDF does not result in "compromising the function of the waste packages or the performance of the underground facility or the geologic setting."

2. P. 2-4, Section 2.1.3, item (a) is confusing. Delete the assumption of a deterministic model.

3. P. 2-6 and 2.7. As stated in the comments on Chapter 1, the requirement of a step-wise approach is unnecessary in a specification.

Chapter 3

1. Bring the relevant parts of Chapter 2 and Chapter 4 into Chapter 3 and relate them to the environmental-parameters specification.

2. Emphasize a DTP style in the specification, using phrases such as:

   "The applicant should assess..."

   "It is expected that the applicant will show evidence of..."

3. Consider adding information regarding groundwater flow rates, radiolysis of water, and phase changes (water/steam).

4. Deal with the issue of "catastrophic" events. This question comes up in Chapter 3 as well as Chapter 1 and the Appendices. The existing draft DTP does not deal with these events except to exclude them. The DTP should state guidance with respect to how DOE should consider them -- ignore them, rule them out only after a careful, probabilistic screening, or some other course of action.

This is relevant also to less than "catastrophic" earthquakes. Please consider adding moderate ground motion and the impact on load analysis to the specification.

5. State how the Appendices relate to the specification and how DOE should use them. For example, Appendix B presents a number of failures modes; is DOE's environmental-parameter modeling expected to consider all of them, ignore those labeled "insignificant" or use some other criteria?

6. Bring the substance of Appendix C (prioritization) into Chapter 3 and relate it to the specification. Expand the discussion of the prioritization criteria that were used. If the professional judgment of the authors is the basis, say so.

Specific Comments on Chapter 3

1. P. 3-1, 1st sentence. Change this sentence to read "...a model is required that can demonstrate reasonable assurance by quantitatively predicting the release of..."

2. P. 3-1, 1st paragraph, 9th line from top. Please elaborate "certain restrictiv conditions" referring to 10 CFR 60.113(b).

3. P. 3-1, 1st paragraph, last two words. Change "underground facility" to "engineered barrier system."

4. Section 3.1, 1st sentence. Change the words "extensive analysis" to "evaluation" or some words to indicate that the analysis was a qualitative evaluation involving, in many cases, the judgment of present state-of-the-art of what is known about the dominant parameters.

5. Section 3.1, last sentence. The ranking of importance of the parameters is similiar to those stated in pages 23-32 of NUREG/CR-3219, DTP, Waste Package Performance After Repository Closure, August 1983. Please reference the source of the analysis. If the content of NUREG/CR-3219 was considered, say so.

6. P. 3-6 and 3-8. The time-step approach need not be the only acceptable way to handle time-dependence problems. (See specific comment (11) on Chapter 1.) We do agree that time-dependence and interaction effects must be accounted for in the analysis.

7. P. 3-11, last paragraph. This paragraph outlines the four steps to meet the "minimum requirement" for input data for the environmental

methodology/model. It conflicts with the sentence on P. 3-12 which says that it is quite possible that these steps may not be necessary. Please rewrite this to remove the confusion.

Chapter 4

1. Restructure Chapter 4 as Appendix E. The codes discussed in this chapter are all evolving rapidly. Emphasize the preliminary nature of these codes since none of these codes have been claimed by DOE as the ones they will be using. Placing this as an appendix also makes updating the DTP less involved in the future. It should be rewritten using the existing information in a style more appropriate and useful for a DTP. The concept is to restructure this information to be responsive to the following DTP objectives: "to define examples of types of models and methods acceptable for determining repository environmental parameters" and "examples of types of data and information, both inputs and outputs expected when using these models or methods." On this latter objective, ORNL would have to add the input data and information needs generally required by the codes/methods and to list the output data and form useful to performance assessors.

   The strategy would be to restyle the information to give good examples of specific codes/methods capable of accurately generating or representing the repository environmental parameters ... this would cover not only the codes/models outlined by BWIP in their Performance Assessment Plan but also others you have discussed and perhaps others you have not listed (e.g., in the structures area like SPECTROM or ABAQUS (from EPRI)).

   The DTP could discuss any serious problems or limits in today's codes (e.g., known limits with groundwater models and mass transport and chemical reactions). Carefully identify limits and related problems but in no way directly critique current BWIP practices or plans. Be accurate and objective but not critical of any agencies' specific work as the DTP is not the place for this.

   An important point in this section is the keying of the codes with the specification descriptions presented in Chapter 3.

Appendix A

1. Address the "catastrophic" events issue as discussed earlier.

2. Clarify differences between known facts, authors' opinions, and NRC policy. If the intent is to set policy, state it as such.

Specific Comments on Appendix A

1. P. A-5, line 9. The words "glass waste from overpack" should be "glass waste, overpack".

Appendix B

1. Address the "catastrophic" events issue as discussed earlier.

2. Put the failure modes and their prioritization into context as discussed in comment #5 on Chapter 3.

3. Add a new section in B.2.1 to discuss wet and dry cycle leaching.

Specific Comments on Appendix B

1. P. B-1, Section B.1.1. The last part of this paragraph is confusing. Does the ultimate failure mode refer to the most dominant of the "thermal/mechanical failure modes" discussed in this section?

2. P. B-15, 2nd paragraph. Please cite reference for the conclusion that if molten glass is poured into a thin-walled stainless steel canister and allowed to cool, the canister will fail by SCC in less than 10 years.

3. P. B-22, 3rd sentence. Please cite reference to support such a strong statement.

4. P. B-24, 2nd paragraph, last word. The word "crack" should be "cracking."

5. P. B-51, Section B.3.1.2, 4th line. The word "hat" should be "that."

6. P. B-55. Please check whether the dominant source of gamma rays in the packing results from the decay of Cs-137 and Sr-90 rather than Cs-135 and Sr-90 as stated in the first paragraph of Section B.3.1.5.

Appendix C

1. Link the prioritization of environmental parameters to the similar discussions in the other DTPs, if possible. If the other DTPs cannot be incorporated, add additional information to clarify the intent.

2. See comment #6 on Chapter 3.

3. Deal with the "unexpected tectonic activity" statements, as discussed earlier.

4. Clarify the meaning of importance of parameters in the prioritizing rationale. The author has identified three considerations: (a) effects of the parameter on waste package life; (b) effects on radionuclide release; and (c) degree of uncertainty of the value of the parameter on the performance assessment of the waste package. I suggest inclusion of a fourth factor which is the controllability of the values of the parameters in the engineered barrier system. The effect of a parameter on the engineered barrier system can vary depending on whether it can be controlled through design.

Appendix D

1. Add an introductory portion that states the intent of Appendix D and describe how DOE should use the information. If the only intent is to provide the reader with example data to get a feel for the physical realities, say so.

2. Recognize that some of the information in Appendix D has been questioned (Review Meeting on February 14), and review the ranges in view of the intent of the Appendix.

Specific Comments on Appendix D

1. P. D-7, 12th line from the top. This section expresses the author's opinion that the Grande Ronde groundwater is reducing in nature (which agrees with BWIP's claim). In a recent BNL progress report on experimental work done in the absence of methane and in the absence of gamma radiation, it was concluded that an oxidizing environment exists in BWIP (BNL-NUREG-24297, February 1984). This discrepancy must be resolved.