



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MAR 20 1989

MEMORANDUM FOR Ronald L. Ballard, Chief
Geosciences and Systems Performance Branch, HLWM

FROM: Joseph O. Bunting, Chief
Engineering Branch, HLWM

SUBJECT: COMMENTS ON "APPROACH AND DECISION CRITERIA FOR DEVELOPING
A PERFORMANCE ASSESSMENT REVIEW STRATEGY (PARS)"

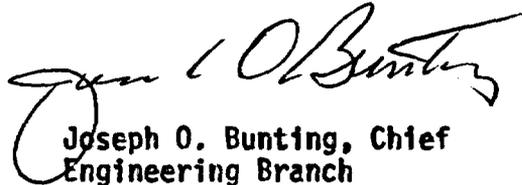
Per your request dated March 1, 1989 (HLEN Ticket 890006), we have reviewed the Approach and Decision Criteria for Developing a Performance Assessment Review Strategy (PARS) document. As a result of our review, we have the following general comments regarding the proposed approach outlined in Section C:

- (1) Step 2 of the PARS calls for categorizing the performance assessments by purpose. The purpose of each PA is to evaluate DOE's findings on the performance objectives. Step 2 assumes that evaluating the performance objectives can be done in a piece meal manner. It may be more prudent to evaluate each performance objective as a whole. Example: To evaluate 60.113(a)(2) (GWTT), it may be necessary to do mechanical, geochemical and hydrologic modeling. It would seem inappropriate for the NRC to do thermo-mechanical and geochemical modeling and not include the hydrologic modeling. Therefore, we believe that if the NRC participates in PA modeling activities, the entire performance objective should be evaluated.
- (2) It is not apparent from a review of the PARS that the criteria will be effective for determining what modeling activities should be performed. The criteria should be more general. For instance: a. Are validated and verified codes available? b. If codes are not available, is there enough time to develop new codes before licensing? c. Do we have resources available (staff and money) for development and/or operation of codes? d. Do some performance requirements portend a greater importance to public health and safety (e.g. overall EPA standards)?

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Our detailed comments and suggestions for sections A and B are provided in the attached copy. If you have any questions about our review contact John Buckley or Kien Chang.



Joseph O. Bunting, Chief
Engineering Branch
Division of High-Level Waste Management

Attachment:
As Stated



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NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MAR 1 1989

*John - Ple. review
and prepare response
memo for SOB
signature. Note
due date.
pick
3-2*

MEMORANDUM FOR:

John J. Linehan, Director
Repository Licensing and Quality Assurance
Project Directorate, HLWM

Joseph O. Bunting, Chief
Engineering Branch, HLWM

Donald L. Chery, Jr., Section Leader
Hydrologic-Transport Section
Geosciences & Systems Performance Branch, HLWM

Philip S. Justus, Section Leader
Geology-Geophysics Section
Geosciences & Systems Performance Branch, HLWM

FROM:

Ronald L. Ballard, Chief
Geosciences & Systems Performance Branch, HLWM

SUBJECT:

REVIEW OF APPROACH AND DECISION CRITERIA FOR PERFORMANCE
ASSESSMENT REVIEW STRATEGY

Enclosed are the proposed approach and decision criteria for developing the Performance Assessment Review Strategy (PARS). The criteria have been developed in light of the several meetings and many discussions among HLWM staff since October 1988. The PARS has been undertaken as an update of the Modeling Strategy Document (MSD), July 1984. Like the MSD, PARS is needed to plan the approach for the staff's review of DOE's performance assessment and to apply the staff resources efficiently in using independent modeling in the review. It is based on the premise that the staff will do whatever is necessary to assure that public health and safety are protected; however, the staff will not expend scarce resources on independent modeling that is not essential to meeting this objective. Thus, the staff will critically evaluate and comment on all aspects of DOE's performance assessment, but the degree to which independent numerical analyses and modeling will be performed in support of these reviews will be determined by its need and appropriateness in reviewing the particular DOE analysis or assessment in question. The enclosure describes the approach and criteria that would be applied to develop the PARS.

Please review and provide any comments to me by March 15. Staff contact:
Pauline Brooks, extension 20404.

for
Donald L. Chery

Ronald L. Ballard, Chief
Geosciences & Systems Performance Branch, HLWM

Enclosure:
As stated

cc: M. Silberberg, WMB/RES
R. Johnson, RLPD/HLWM

*Pauline Brooks
Bunting
Justus
Chery*

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APPROACH AND DECISION CRITERIA FOR DEVELOPING A
PERFORMANCE ASSESSMENT REVIEW STRATEGY (PARS)

A. Introduction

The purpose of this document is to provide a structured basis for updating and revising the Modeling Strategy Document (MSD), July 1984. It outlines an approach for determining the appropriate numerical analyses to be used by NRC staff in support of its independent evaluation of the DOE's demonstration of compliance with regulatory requirements for construction of a repository. The approach includes explicit decision criteria to determine the specific areas for which the staff would augment its evaluation by independent numerical analyses. It also contains criteria for deciding the nature of the independent numerical analyses considered appropriate for reviewing particular kinds of analyses or assessments. This approach and decision criteria are to form the basis of a Performance Assessment Review Strategy (PARS).

Such an explicit statement of decision criteria is necessary for establishing a program to guide staff preparations for reviewing a license application. The Congressionally mandated three-year license review period, coupled with limitations on staff resources, demands that potentially resource-intensive activities such as numerical modeling be effectively focused. Further, it is intended to provide a structure for staff development of its familiarity with the proposed repository site as data are being acquired.

This document discusses the principles and criteria upon which to base decisions about the appropriate type of numerical analyses to be used in reviewing the components of DOE's performance assessments. ~~It does not undertake to apply these principles and thereby match specific review actions to specific components of a compliance demonstration~~ — del

Implementation of the decision criteria is the next planned step in developing the PARS.

B. Underlying Assumptions

First, it should be emphasized that NRC will critically evaluate and comment in detail on all of DOE's work. The issue at hand is when the NRC staff's review of DOE's performance assessments are best augmented by what kinds of independent numerical analysis in reviewing the DOE's compliance demonstration. The following discussion is based generally on the same simplifying, key assumptions used in the MSD. These assumptions, as used in this document, are summarized below.

?
UNLESS

(1) DOE will use computer modeling to demonstrate that repository performance complies with several of the performance ~~criteria~~^{objectives} of 10 CFR 60. Numerical analyses may be the primary (or sole) demonstration of compliance for some ~~criteria~~^{objectives}, and may be combined with other arguments (e.g., empirical studies or expert judgment) for others.

(2) DOE will assert that these ~~codes~~^{models} either (1) ~~address all of the site features and/or processes which significantly affect repository performance, compliance with a particular criterion, or (2) some features and/or processes not directly addressed by the codes.~~ ^{adequately represent} ~~adequately represent the site system~~ ^{such as} ~~spec~~

(3) During site characterization, the NRC staff ~~will~~^{must} develop the capability to ~~independently~~ evaluate compliance with each of the numerical criteria of 10 CFR 60. However, such evaluations ~~will~~^{may} not necessarily involve the ~~independent~~ use of models or computer codes.

- (7) The NRC staff, through (1) access to DOE data, (2) interactions with DOE investigators during site characterization, and (3) modeling assessments and sensitivity studies during site characterization, will be very familiar with site and data at the time of license application. It is assumed that, during site characterization, NRC staff will identify necessary sensitivity studies to DOE, ~~that DOE has not already identified on its own.~~

C. Approach for Development of the Performance Assessment Review Strategy

Step 1. List the ^{DOE} performance assessments that are ^{necessary} ~~anticipated~~ for demonstrating compliance with regulatory requirements. *Identify the numerical analyses required for each performance assessment.*

Step 2. Categorize the ^{numerical analyses} ~~performance assessments~~ of step 1 by purpose ~~of analysis~~. The types of analyses by purpose are:

a. Calculation of a physical quantity for use in assessing a repository subsystem or for use in assessing overall repository system performance.

b. Supporting analyses to show, for ^{an analysis} ~~a performance assessment~~ of type a above:

- (1) adequacy of assumptions,
- (2) derivation of parameters from field measurements,
- (3) estimation of parameters, boundary conditions, initial conditions, geometries, or
- (4) validation of models.

DECISION CRITERIA FOR A PARS/

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(of step 2)

Step 3: Rate the importance of the analysis to showing compliance with 10 CFR Part 60. The rating factors for this step are:

- a. Does DOE's numerical analysis directly calculate a value to demonstrate compliance with a regulatory requirement? (Yes, No)
- b. Is the numerical analysis important to a supporting analysis? (Yes, No)
- c. Is the numerical analysis relied on as the (Sole, Primary, Secondary) argument relative to other arguments in demonstrating compliance?

B(1) on page 2 says they are the same.

Figure 1 shows how these factors are ~~to be~~ rated.

Assign one of the following review approach to each level of importance shown in figure 1

Step 4. For each type of analysis identified (Step 2 above), indicate the possible approaches to modeling available to augment the review. The possible review approaches are the use of:

- 1. ^{critical review but} No modeling
- 2. Simple, conservative models with conservative data.
 - a. Used by DOE for the analysis
 - b. Not used by DOE for the analysis
- 3. Reviewed ^{using} and qualified DOE or third party models and computer codes.
 - a. Used by DOE for the analysis
 - b. Not used by DOE for the analysis
- 4. ^{Review using} Models and codes independently developed by NRC.

* Steps 2-5 can be done prior to ever getting a PA from DOE.

NOTE: In determining the types of numerical analysis appropriate to confirming a DOE analysis, there are two guiding principles: (1) the confirmatory analysis should, to the extent possible, allow for appropriate differences relative to the DOE analysis to accomplish that independent review, and (2) the confirmatory analysis should be as simple as possible (no more complex than ~~is required to accomplish an independent review~~ *the DOE analysis?*).

A combination of several approaches might be deemed necessary if several aspects of an analysis are uncertain. Choices are depicted in Figure 2.

Step 5: Characterize each type of confirmatory analysis in terms of the following sequence of questions to determine resource impact. It is primarily with respect to the use of computer codes that the question of resource impact arises. The need for using computer codes should be considered if importance is equal to or greater than medium.

what are the criteria for determining resource impact?

1. Code Development
 - a. Do computer codes exist?
 - b. Is the process sufficiently understood to be modeled?
 - (1) Is the required data available?
 - (2) Do alternative process models exist on the basis of known data?
 - (3) Is code development independent of DOE needed?

2. Code Use
 - a. What testing of the code is needed to develop confidence in the code?
 - b. What training of staff is needed to develop necessary familiarity with code?

Figure 3 presents a decision matrix relating resource impact to importance.

These should be asked prior to step 4.

FIGURE 1. - IMPORTANCE OF ANALYSES

<u>QUESTION A</u> ^a	<u>QUESTION B</u> ^b	<u>QUESTION C</u> ^c	<u>THEN, IMPORTANCE IS</u>
YES	NO	SOLE PRIMARY SECONDARY	VERY HIGH HIGH MEDIUM
NO	YES	SOLE PRIMARY SECONDARY	HIGH MEDIUM LOW
NO	NO	-----	NIL

FIGURE 2 RECOMMENDED REVIEW APPROACHES

IF UNCERTAINTY LIES IN

CONCEPTUAL MODEL
(FUNDAMENTAL PHENOMENON OR
MATHEMATICAL DESCRIPTION)

METHOD OF SOLUTION

ANALYST'S USE OF CODE

CONSERVATISM OF BOUNDS

THEN, REVIEW APPROACH IS

USE 4
INDEPENDENTLY DEVELOP
CODE WITH DIFFERENT
(ALTERNATE) MODEL

USE 3B or 4
CODES NOT USED BY DOE OR
INDEPENDENTLY DEVELOP NEW
CODE WITH SAME MODEL, BUT
DIFFERENT SOLUTION METHOD

USE 3A
CODE USED BY DOE

USE 2B

FIGURE 3. TRADE-OFF BETWEEN IMPORTANCE AND RESOURCE IMPACT

		<u>IMPORTANCE</u>				
<u>RESOURCE IMPACT</u>		<u>VERY HIGH</u>	<u>HIGH</u>	<u>MEDIUM</u>	<u>LOW</u>	...
?	<i>veig High</i> <u>HIGH</u>	Y	D	N	N	
	<u>MEDIUM</u>	Y	Y	D	N	
	<u>LOW</u>	Y	Y	Y	D	

KEY: Y=YES, N=NO, D=DISCRETIONARY

MAR 20 1989

MEMORANDUM TO BALLARD/BUCKLEY

- 1 -

MEMORANDUM FOR Ronald L. Ballard, Chief
 Geosciences and Systems Performance Branch, HLWM

FROM: Joseph O. Bunting, Chief
 Engineering Branch, HLWM

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MEMORANDUM TO BALLARD/BUCKLEY

- 1 -

Our detailed comments and suggestions for sections A and B are provided in the attached copy. If you have any questions about our review contact John Buckley or Kien Chang.

Original Signed By

Joseph O. Bunting, Chief
Engineering Branch
Division of High-Level Waste Management

Attachment:
As Stated

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NAME	:JBuckley/yb	:RWeller	:JBunting	:	:	:	:
DATE	:3/14/89	:3/15/89	:3/20/89	:	:	:	:

DECISION CRITERIA FOR A PARS/

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- (4) In those areas where the NRC staff ~~decides to~~ ^{must} use models or computer codes ~~for an independent evaluation~~ ^{to evaluate DOE's performance assessments}, independent NRC development of such models or codes ~~is not necessarily~~ ^{may not be} required. It may be appropriate to use ^{technically defensible} models or codes developed by DOE or by a third party. ~~if the NRC staff's review of the technical merits of the models or codes allows the staff to use them confidently.~~
- (5) The NRC staff will not have sufficient resources available to ~~independently~~ develop, operate and maintain a full suite of codes for all facets of repository performance. ~~Similarly, even if DOE or third party codes are used in some areas,~~ ^{Furthermore,} the NRC staff may not have sufficient resources available to conduct detailed ~~independent~~ computer ~~code~~ analyses in all areas ^{with existing codes,} without significantly affecting the timeliness of its license application review.
- (6) a. NRC will have substantial advance notice of the codes that DOE will use to demonstrate compliance, and these codes will reflect NRC guidance to DOE as to how processes, parameters, and variables should be treated. DOE codes will have been developed, documented, verified, benchmarked and validated (to the extent practicable) in accordance with ~~NRC guidance~~ ^{acceptable QA procedures.}
- b. The codes, data and results of analyses used by DOE to support the application will be sufficiently well documented that the simulations could be repeated independently by technically competent reviewers.
- c. The codes will be made available to the NRC sufficiently in advance of the application for the staff to become competent in exercising them, ~~should they choose to do so.~~