DECISION CRITERIA FOR A PARS

MAR 1 1989



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.

/S/ by Don Chery, Jr.

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

Enclosure:
As stated

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



414.8.1
Wm-1
NH18

| OFC | HLGP | HLGP | HLGP | | | | |
|---|---|---|---|---|---|---|---|
| NAME | PBrooks/cj | SCoplan | RBallard | | | | |
| DATE | 3/1/89 | 3/1/89 | 3/1/89 | | | | |

0140

DISTRIBUTION

| | | | |
|---|---|---|---|
| Central Files | REBrowning, DHLWM | BJYoungblood, DHLWM | RLBallard, HLGP |
| JOBunting, HLEN | JLinehan, HLPM | HLGP r/f | NMSS r/f |
| PDR & LPDR | LLS | PBrooks, HLGP | SCoplan, HLGP |
| RBernero, NMSS | | | |

| OFC | HLGP | HLGP | HLGP | | | | |
|---|---|---|---|---|---|---|---|
| NAME | PBrooks/cj | SCoplan | RBallard | | | | |
| DATE | 1/ /89 | 1/ /89 | 1/ /89 | | | | |

# 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.

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.

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

(2) DOE will assert that these codes either (1) address all of the features and/or processes which significantly affect repository compliance with a particular criterion, or (2) bound features and/or processes not directly addressed by the codes.

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

(4) In those areas where the NRC staff decides to use models or computer codes for an independent evaluation, independent NRC development of such models or codes is not necessarily required. It may be appropriate to use 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, the NRC staff may not have sufficient resources available to conduct detailed independent computer code analyses in all areas 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.

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.

(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 performance assessments that are anticipated for demonstrating compliance with regulatory requirements.

Step 2. Categorize the 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 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.

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?

Figure 1 shows how these factors are to be rated.

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. 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 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. Models and codes independently developed by NRC.

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).

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.

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.

FIGURE 1 - IMPORTANCE OF ANALYSES

| QUESTION A | QUESTION B | QUESTION C | THEN, IMPORTANCE IS |
|---|---|---|---|
| YES | NO | SOLE | VERY HIGH |
| | | PRIMARY | HIGH |
| | | SECONDARY | MEDIUM |
| NO | YES | SOLE | HIGH |
| | | PRIMARY | MEDIUM |
| | | SECONDARY | LOW |
| NO | NO | ------ | NIL |

FIGURE 2 RECOMMENDED REVIEW APPROACHES

| IF UNCERTAINTY LIES IN | THEN, REVIEW APPROACH IS |
|---|---|
| CONCEPTUAL MODEL (FUNDAMENTAL PHENOMENON OR MATHEMATICAL DESCRIPTION) | USE 4 INDEPENDENTLY DEVELOP CODE WITH DIFFERENT (ALTERNATE) MODEL |
| METHOD OF SOLUTION | USE 3B or 4 CODES NOT USED BY DOE OR INDEPENDENTLY DEVELOP NEW CODE WITH SAME MODEL, BUT DIFFERENT SOLUTION METHOD |
| ANALYST'S USE OF CODE | USE 3A CODE USED BY DOE |
| CONSERVATISM OF BOUNDS | USE 2B |

FIGURE 3. TRADE-OFF BETWEEN IMPORTANCE AND RESOURCE IMPACT

| | IMPORTANCE | | | |
|---|---|---|---|---|
| RESOURCE IMPACT | VERY HIGH | HIGH | MEDIUM | LOW |
| HIGH | Y | D | N | N |
| MEDIUM | Y | Y | D | N |
| LOW | Y | Y | Y | D |

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