DRAFT

EXECUTIVE SUMMARY

YUCCA MOUNTAIN PROJECT OFFICE
TOTAL SYSTEM PERFORMANCE ASSESSMENT
MEETING

Las Vegas, Nevada

18-20 November 1991

Date of Report

20 December 1991

Draft Report Prepared for
the U.S. Department of Energy by

The Nuclear Waste Management System
Management & Operating (M&O) Contractor,
Under Contract No. DE-AC01-91RW00134

Total System Performance Assessment (TSPA)

As illustrated in Figure 1, total system performance assessment (TSPA) combines estimates of engineered system behavior and fluid flow in the geosphere. An important point also illustrated in Figure 1 is that each of these estimates is based on calculations using a hierarchy of codes and models that vary in complexity. This complexity-hierarchy is sometimes referred to as the modeling pyramid. Codes and models at or near the top of the pyramid are intended to be used in support of management decision making, and can be useful in broad analyses of sensitivity. Codes and models from the lower tiers of the pyramid are used in more complex analyses in support of testing and site characterization activities. The models exercised for the TSPA reported at this Meeting did not include detailed process models at the base of the modeling pyramid.

Definitive models can not be based on sparse data and incomplete understanding. Therefore, TSPA analyses currently use preliminary models. When preliminary models are used to focus and refine testing and Site Characterization Program activities, analyses are used to define the importance of certain conceptual models and of processes embedded within system-level models. This information can then be used to prioritize information requirements.

As new information becomes available, however, conceptual and mathematical models at all levels of the pyramid will be reevaluated. Codes and models are expected to change in response to this new information. This could mean iterative use of models at all levels of the hierarchy appropriate to the data or data-needs being evaluated.

General Meeting Background

The Total System Performance Assessment (TSPA) Meeting of the Yucca Mountain Project Office was held in the Large Conference Room at the Project's facilities at 101 Convention Center Drive, Las Vegas, Nevada, 18-20 November 1991.

Of the 56 attendees, 53 represented the Yucca Mountain Project Office and its associated contractors, or contractors supporting the Office of Civilian Radioactive Waste Management in Washington, D.C. The three others were an observer from the U.S. Nuclear Regulatory Commission's Las Vegas office, a representative of the Electric Power Research Institute (EPRI) and an EPRI contractor. An attendees list is attached (Attachment A).

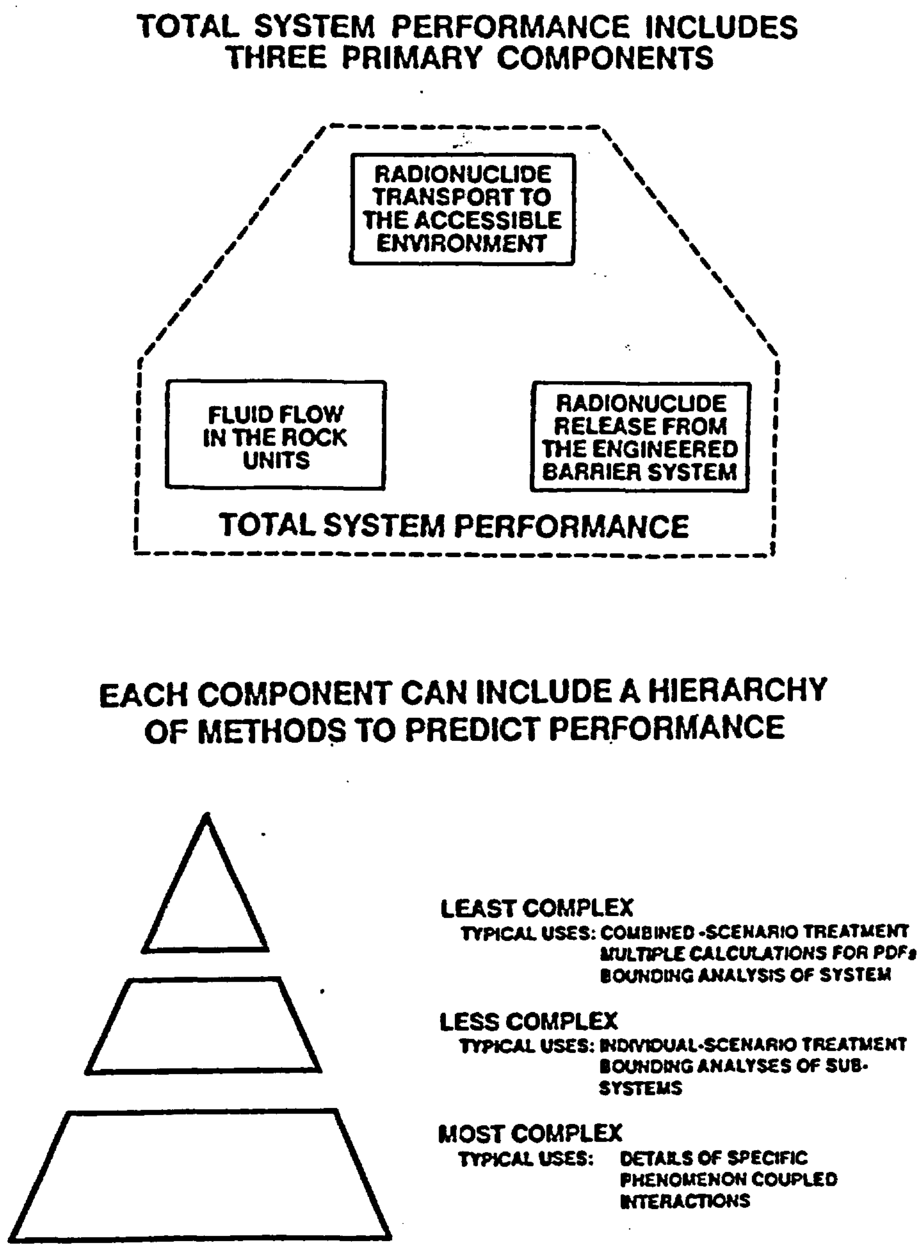

FIGURE 1. Components of Total System Performance Assessment (TSPA) and Schematic of TSPA Modeling Hierarchy

The TSPA Meeting was officially announced by a letter from Carl Gertz, Director of the Yucca Mountain Project Office. The Agenda followed in the TSPA Meeting was a slightly revised version of the one accompanying the TSPA Meeting announcement, and is attached (Attachment B).

The first and second days of the TSPA Meeting were opened with a "Welcome" by Jeremy Boak, Acting Chief of the Technical Analysis Branch within the Yucca Mountain Project Office's Regulatory and Site Evaluation Division. Mr. Boak's summary remarks at the end of the third day officially adjourned the Meeting. Moderation of the TSPA Meeting was assigned to Abe Van Luik of the Management & Operating (M&O) Contractor's Las Vegas office.

Content of this Executive Summary

For the purposes of this Executive Summary, the TSPA Meeting is divided into two parts. Part One consists of the first day's overviews of total system modeling efforts. Part Two consists of the second and third days' more detailed discussions of the TSPA exercise sponsored by the Yucca Mountain Project Office.

Presentations were informal and many view-graphs showed preliminary results needing refinement, and recalculation in some instances. Therefore, there was no distribution of presentation materials, and reproduction of these materials in this Executive Summary would be inappropriate.

Description of Meeting

PART ONE

Golder's RIP Model

Ian Miller, of the Golder Associates Inc. office in Redmond, Washington, gave an overview of work in progress on developing the Repository Integrated Performance (RIP) total system model. This work is being done for the Office of Civilian Radioactive Waste Management in Washington, D.C. The stated objective for RIP is for it to be capable of being used as a management tool.

The RIP model consists of a stochastic framework that can sample a series of computational algorithms. The stochastic framework is used to select parameter values from probability density functions or time histories, and each complete parameter set is then fed into the computational algorithms thus becoming a realization of the state of the system. Parameter uncertainty and variability are reflected in the probability density functions. The modeling framework is designed to be flexible to allow a user to modify existing modules or substitute more complex mathematical formulations where there are currently more simplistic representations.

RIP is designed to consist of waste package behavior, transport pathways, and disruptive events models. It is to be capable of addressing a number of disruptive event scenarios such as volcanism, faulting/seismic activity, and human intrusion. Development of RIP is continuing, and calculational results will be available in 1992.

The EPRI High-Level Waste (HLW) Performance Assessment Model

Robert Shaw of EPRI and Robin McGuire of Risk Engineering, Inc., gave an overview of the EPRI HLW Project, demonstrated the preliminary EPRI HLW Performance Assessment Model, and discussed its developmental status. The EPRI HLW Project has as its objectives the development of an integrated methodology for early site suitability assessment and issue prioritization. Involving the DOE in the development and implementation of this model has also been an objective. A development team of 16 experts and two observers is involved under the direction of Mr. Shaw.

Recent accomplishments have included the addition of a number of modeling capabilities such as gaseous transport, time- and temperature-dependence and climatic effects. The engineered system analysis capability has also been improved. Workshops to define a seismic effects submodel are being conducted and planned for the next six months.

A demonstration of selected capabilities included the showing of view-graphs with numerous complementary cumulative distribution functions (CCDFs) for individual system realizations. The EPRI HLW Performance Assessment Model is conceptually similar to the Golder RIP model. These two efforts differ primarily in the handling of probabilities. The EPRI model consists of discrete nodes where distinct probabilities of different legs are assigned. The RIP model, as envisioned, will apparently allow for different legs to be assigned from a probability density function. The two approaches represent independent efforts at defining process relationships, judging possible meaningful disruptions, and elucidating parameter probability distributions.

Total System Evaluation in Support of the Early Site Suitability Evaluation (ESSE) Effort

Larry Rickertson of the Weston Technical Support Team in Washington, D.C., briefly explained the ESSE methodology and reported the results of a simplistic total system evaluation he performed in support of the ESSE effort. The modeling results shown were preliminary, and had not been reviewed by the ESSE Core Team at the time of the TSPA Meeting. Thus, this modeling has not yet been incorporated into the ESSE effort.

The Rickertson evaluation used a model that selected from distributions of parameters describing the source terms for gas and aqueous releases, radionuclide solubility and retardation, and ground-water travel time. A number of scenarios were analyzed through assignment of different parameter distributions to simulate increased flux, water-table rise, human intrusion, and colloid formation cases. Uncertainty analyses were performed by analyzing alternative flux, travel-time, and source term distributions.

The overall conclusion was that no information or features modeled suggested that the system modeled would be unsuitable. If fast ground-water flow-paths exist, however, system suitability may be in question. The approach employed in the model consisted of assigning probabilities to "fast flow-paths" with very short travel times to the saturated zone. Although this is a simplistic approach, it is common in higher level TSPA modeling to simplify the treatment of fracture-flow, and to treat fractures as fast flow-paths. The choices of descriptive parameter distributions brings the applicability of this model and its results to Yucca Mountain into question, but the salient point is the suggestion that an important issue for determining site-suitability may be the presence and/or abundance of fast ground-water flow-paths in the unsaturated zone, and an important issue for TSPA is developing an appropriate model for fracture-flow in the Yucca Mountain context.

An Unscheduled Discussion on the Nature of the CCDF

Partly in response to the Rickertson presentation, Robin McGuire of Risk Engineering, Inc., the contractor supporting EPRI, asked for time to present a discussion on the nature of the cumulative complementary distribution function (CCDF). The CCDF is a required part of showing compliance with the 40 CFR Part 191 containment standard.

Rickertson had used CCDFs to illustrate probable performance toward the upper bounds of uncertainty, suggesting different CCDFs would have resulted for simulations using ranges of parameter values closer to expected value estimates. McGuire suggested that uncertainty (as in fracture density estimates) and randomness (as in the time of an event's occurrence) could, but not necessarily should, be represented in the same CCDF curve.

As site data are obtained and, presumably, more certain knowledge is obtained about the current state of features and processes important to performance, the slope of the probability versus consequence curve may be expected to steepen. The steeper curves would reflect increased certainty about the lower-consequence processes and events, and the elimination of a number of large-consequence/low-probability events through the refinement of consequences and the assignment of lower probabilities. Some commentors cautioned that the discussion on the effects of obtaining site data on the CCDF was inappropriately optimistic in that it assumed findings regarding operative processes and important features supporting current conceptualizations, and experimental data ranges near those currently expected.

Alternatively, multiple CCDF curves could be shown on the same plot representing the release probabilities for an uncertain distribution of event probabilities. Rickertson's CCDFs appeared to represent the upper bound on such a range of curves. A question addressed was what happens to this range of curves as site data is obtained. It was postulated that more definitive site data would be expected to narrow the uncertainty range with either an upward or downward shift on the consequence axis, but within the earlier uncertainty range.

The Yucca Mountain Integrating Model (YMIM) Being Developed By Lawrence Livermore National Laboratory (LLNL)

Bill Halsy and Alan Lamont of Lawrence Livermore National Laboratory presented an overview of YMIM, a model under development which is designed to estimate mass transport out of the near field over time. YMIM is designed to be a simplified model that can accept as input data results obtained by exercising the more detailed PANDORA waste package code.

If fully developed, YMIM would run through a sequence of modules for each specified time period. Outputs would include dissolution and transport during the period as well as a definition of the state of the system at the end of the period. Foreseen YMIM modules include hydrology, geochemistry, container and rod failure, container flow, nuclide chemistry and dissolution, and radionuclide transport. Possible future developments would add more flexibility and allow more complex interactions to be modelled.

The preliminary YMIM model was created in the summer of 1991. Although the model is simple, it focuses on the waste package and contains modules estimating corrosion. YMIM also contains expressions allowing the nesting of rod failures within container failures.

PART TWO

Overview of Part Two

Felton Bingham of Sandia National Laboratories (SNL) and Paul Eslinger of the Pacific Northwest Laboratory (PNL), representing the two major participants in the 1991 TSPA exercise, gave introductions to the material to be presented in Part Two.

The goal of this TSPA was to demonstrate the abstraction of data and show calculational results for higher level calculations. Higher level, in this case, refers to the top level of the three-tiered modeling pyramid with research and process codes at the bottom, subsystem codes in the middle and total system codes at the top. This exercise was not comprehensive in terms of components modeled, and used conceptual models not completely justified at this stage. Therefore these analyses are not adequate to support higher-level suitability findings.

This TSPA demonstration included a number of calculations not included in previous total system assessments. Included in this expanded scope were: 1) stochastic simulations, 2) doses, 3) the saturated zone to the accessible environment, 4) gas transport, 5) more release pathways, and 6) a more detailed source term with more radionuclides. A similar modeling approach was used in both the PNL and SNL efforts. The primary difference was that two-dimensional modeling was done by PNL and equivalent one-dimensional modeling was done by SNL. Lawrence Livermore National Laboratory provided the source term for the SNL calculations. Dose calculations were provided by PNL for both the SNL and PNL total system results.

Many of the individual presentations made for Part Two (see Attachment B, Days 2 and 3) gave overviews of the modeling at a lower level of detail than is useful to discuss in an Executive Summary. The content of this Executive Summary for Part Two is, therefore, a summary of each major analysis instead of a summary of each presentation on that analysis.

Modeling and Results

<u>The Source Term Models</u>:

The PNL and LLNL/SNL source-term models were basically comparable.

Gaseous releases were modeled as impulses after container failure, and container failure rates were sampled from assumed distributions. These failure distributions were not the same for the two moling efforts, however. Flow-through and wet-continuous water/waste contact modes were modeled. One model calculated solubility release limits based on assumed near-field geochemical environments. The other calculated releases for hypothetical discrete flux values. One model (PNL) considered releases from the glass waste form while the other model (LLNL/ SNL) assumed spent fuel inventories only.

An Impromptu Presentation on Waste Package Design Changes:

David Stahl of the M&O Contractor presented a thumbnail sketch of some of the changes to be evaluated and perhaps proposed for the reference waste package design in the near future. Basically, a multiple-barriered, more robust package is envisioned with performance being somewhat independent of the nature of the near-field environment. The packages may, therefore, be appropriate for use in any repository in any suitable site. The selection of a sacrificial barrier material with known degradation modes, and the selection of filler materials for specific physicochemical properties has implications for source-term performance modeling.

Groundwater Flow Modeling:

The saturated-zone models of both SNL and PNL were based on an equivalent porous medium conceptualization. PNL used a two-dimensional, stochastic representation of the tuff and carbonate aquifers to generate realizations of the horizontal flow and transport. SNL used a one-dimensional deterministic representation of the saturated zone aquifers using published, averaged properties.

In the unsaturated zone, both PNL and SNL used an equivalent continuum model with the fracture properties incorporated as part of the relative permeability and capillary pressure curves. PNL used a two-dimensional vertical slice through the repository and included a single fault zone within the model. SNL used one-dimensional stratigraphic columns from the repository to the water table, with the flow simulated stochastically 300 times for each column. SNL also used a discrete fracture representation to define the percent of waste packages potentially providing a source for far-field transport.

The PNL effort simulated two (0.01 and 0.05 mm/yr) fluxes for undisturbed-case analyses. SNL assumed a range of infiltration rates (0.0 - 39 mm/yr). The mean of 1 mm/yr was judged high but reasonable since the exponential distribution used shifted most sampled values to less than 1 mm/yr. The selected range would allow for values to be stochastically selected that could be interpreted as possible under climate-change conditions, and would ensure that some calculations would reach the transition from matrix-dominated flow to fracture-dominated flow.

The lower flux rate calculations resulted in no radionuclides being transported into the saturated zone over the time periods simulated, whereas the higher-flux calculations led to radionuclides being transported into the saturated zone.

A separate calculation of system performance was made based on a model that distributed the available water from a given stochastically-obtained flux value into a network of fractures, some of which represented fast pathways. The conceptualization of continuous fracture flow, with no matrix/fracture interactions allowing return of water from the fractures back into the matrix, led to this model being dubbed the "Weeps" model. The fraction of containers calculated to be intercepted by the assumed distribution of flowing fractures was failed more rapidly than the fraction in contact with the matrix-controlled water flux.

Gas Flow Modeling:

Thermal and humidity-difference driving forces were assumed to drive flow of ^{14}C from the repository to the accessible environment at the surface of the mountain. A series of two-dimensional steady-state simulation was used by SNL to produce gas transit times as a function of temperature. A transient calculation was performed by PNL. Since travel times were relatively short, the source-term model's release rate of ^{14}C was an important determinant of the cumulative release over 10,000 years. A three-order-of-magnitude difference in the assumed unsaturated-zone permeability was responsible for most of the differences in the PNL and SNL results.

Human Intrusion Modeling:

The two modeling efforts used a common stratigraphic and geohydrologic data set to assess human intrusion. Extremely conservative, "worst case" assumptions were made in these assessments: if a driller hit a container, up to the entire content of a waste container could be brought to the surface or released into the saturated zone. If the driller missed a container, contaminated tuffs were brought to the surface (PNL) or released into the saturated zone (PNL and SNL). In the saturated zone, either the slow-moving tuff aquifer or the higher flow rate carbonate aquifer was assumed to receive the waste or contaminated tuff. The total number of holes drilled was either fixed or a distribution. The timing of a drilling event, whether or not it hit a container, and the amount of waste mobilized were randomly determined. Releases were calculated at the accessible environment boundary.

One of the analyses assumed a spent fuel inventory (SNL) while the other (PNL) assumed a mix of spent fuel and high-level waste glass. The results were used to define the more important parameters defining human intrusion scenarios. The probability of drilling, if less than the "1" assumed for these analyses, could reduce the probability of releases. Drilling probability assumptions resulted in multiple drilling events for every 10,000-year period. Aqueous releases were highly dependent on the assumed distributions of groundwater velocities and retardation coefficients. Surface releases, on the other hand, had little relation to site characteristics, except as drilling-frequency may be site-specific.

<u>Basaltic Volcanism Modeling</u>:

The SNL analysis used published estimates specific to Yucca Mountain for recurrence rates and descriptions of the mechanics of intrusion. The conceptualization modeled was a dike that intrudes along a plane behind an upward propagating stress crack and entrains waste as it flows up, releasing waste to the surface. A thousand trials were used by SNL to simulate various dike widths, lengths and orientations. The source term interacted with a dike, and dike length and width were important parameters in determining the release. The results of sensitivity studies showed little effect from varying probability-distribution-function shapes. Results of the SNL analysis were such low releases that this seems to be a scenario that need not be further considered at this time.

The PNL analysis was conceptually similar but assumed higher recurrence frequencies and entrainment rates, based on interpretations of literature not necessarily applicable to Yucca Mountain. The PNL analysis provided a comparison-analysis with much more conservative assumptions. Even the more conservative PNL analysis yielded negligibly low releases to the accessible environment.

<u>Tectonism Modeling</u>:

Tectonism was modeled by varying base-case parameters only. Results, using the model that did not assume very high flux rates, were negligibly different from the base case.

The Total System CCDF:

There was no disagreement over how CCDFs may be combined. CCDFs incorporate scenario probabilities and parameter/modeling uncertainties. Assigning probabilities to scenarios remains an open questionm, however.

Dose Modeling:

A reference individual was assumed for whom whole body dose, dose by organ/nuclide, and time of maximum dose were calculated. Dose results were expressed in terms of cumulative dose over a single 70-year lifetime as well as in terms of cumulative doses over successive lifetimes in 10,000 years. Exposure pathway scenarios were modeled using Hanford Site parameters because the models used were based on ecosystem assumptions and data for that location. Hanford Site desert ecosystem dynamics are expected to be substantially different from Yucca Mountain desert ecosystem dynamics because the climatic and biological regimes are markedly different. The models being used for the Hanford Site are currently incorporated into the SUMO code for calculating groundwater releases, and into the GENII code for calculating surface releases.

The scenarios being modeled were fairly standard ones typically applied to evaluations of low-level waste facilities. These facilities are typically near-surface and thus more readily accessible to the biosphere than deep mined-geologic disposal systems. The likelihood of the postulated farmer near Yucca Mountain or the assumed residential gardener on top of Yucca Mountain was not estimated, however. Maximally exposed individuals modeled included a farmer using contaminated aquifer water 5 km from the repository. A resident directly above the repository is assumed to be breathing air, ingesting home-grown garden produce, and inhaling suspended particulates contaminated by ^{14}C exhaling from the mountain. A driller is modeled who brings up the content of a waste container with either a high-level waste glass or a spent nuclear fuel waste form, and inhales/ingests the resulting contaminated soil. A residential gardener is modeled who moves onto the contaminated site and receives direct exposure, produce ingestion and suspended soil inhalation doses.

Modeling results ranged from minuscule doses for the gas pathways to substantial doses for the intrusive driller and post-drilling residential gardener. Typically, the modeling of spent fuel waste packages resulted in an order of magnitude greater dose commitment when exhumed than the high-level waste glass packages. The doses resulting from the aqueous pathway were zero for 10,000 years for the cases calculated without fast ground-water travel-time pathways. They were higher for cases where fast paths were assumed. The dose values obtained, however, illustrated an important point about using the output of one code as input for another: although the input/output units were correct, the assumptions that defined the value of the output were not what they were assumed to be when the data was next used as input. The results were recalculated.

Lessons Learned From This TSPA Exercise

Part One of the Meeting showed there were a number of current TSPA capability-development efforts. One is to be used for higher-level management purposes and is somewhat independent of the other TSPA development efforts under the Yucca Mountain Project Office. Another TSPA capability is being developed completely independent of DOE, and will be particularly useful in providing independent evaluations of DOE TSPA results.

A significant lesson learned was that there are practical ways of generating total system release CCDF curves. This is significant in the sense that the models, usage, and hardware now available provide the means to generate meaningful CCDFs. Another lesson learned was that the ability now exists to model multiple scenarios, to compare results with a base case, to combine scenarios with a base case, and to use this ability to judge the relative significance of various scenarios.

Part Two of the Meeting showed that performing one iteration of the total system analysis capability should include comprehensive review and assessment of assumptions and data: It is not simply a "turning of the crank" on a TSPA model. If an iteration is to be meaningfully different from a previous one, the calculation of boundary conditions and supporting, derivative data sets that are to be used by the total system models often involves the exercising of the complex models from the lower part of the modeling hierarchy. Finally, even in the case of having exercised models from the top of the hierarchy it takes time to learn from one iteration what needs to be changed in the next iteration to shed light on the particular aspect of the system being evaluated.

The objectives of this TSPA iteration were achieved in terms of demonstrating a TSPA capability, generating CCDF curves, and expanding beyond the Performance Assessment Calculational Exercises of 1990. However, the results of this TSPA are of limited use in programmatic decision-making. The results underscore the need for site data and a firm waste package concept. The ^{14}C-release calculation work was applicable to any site in the unsaturated zone, and results suggest a need for a more robust engineered barrier system in view of current regulatory requirements.

A comprehensive, standard set of data and assumptions is a crucial need for future TSPAs with multiple participants. The communication of system data and specifications is made difficult when different models are involved since a sufficient data set for one may be insufficient for the other. Also, where different conceptual models or levels of modeling detail are involved, assumptions that are sufficient to describe the problem to the one modeling team may not adequately circumscribe the problem as it needs to be defined by the other modeling team. Data inconsistencies and inadequate communications were universal complaints, with a recognition that adequate communications for future iterations will take more time and effort than was allowed for by the performers of this TSPA.

It was recognized that the bounding models and their high-release results reflected current uncertainty in conceptual models and data sparsity. Site-specific data from the Site Characterization Program can help the selection of more realistic conceptual models and the use of more realistic parameters in the codes implementing those models. On the other hand, two activities were identified that could be completed without additional site data: 1) further analyses using the conceptual models incorporated in this TSPA iteration could be used to define parameter sensitivity, and 2) new analyses could be designed to test the importance of conceptual model and process uncertainty.

This TSPA Meeting was not a pessimistic one. In fact the current state of TSPA modeling was seen in optimistic terms, largely because the capability to assess system performance using a number of possible conceptual models has been established. Whether or not any of these models will be used to represent a potential Yucca Mountain repository in the License Application is impossible to say, however.

Recommendations

Discussions at the end of the meeting provided some recommendations. There was no disagreement concerning the need for iterative performance assessments and their potential usefulness to the program. There was discussion about the frequency of these iterations, however, and suggestions ranged from one to two years. This TSPA iteration took 18 calendar months, but the bulk of the work was done in the six months preceding the Meeting, emphasizing the need for better planning. The first part of the next iteration should contain a planning phase wherein objectives are clearly identified, technical issues are addressed and resolved, and the programmatic role of the iteration is defined. The last point is an important one since the objectives need to be understood by the performance assessors so that their effort can be focused and results can be used in a meaningful context. The TSPA reported at this Meeting served capability-demonstration purposes. The next iteration should serve a particular programmatic need, such as evaluating an issue important to the Site Suitability Evaluation effort.

It was also suggested that within the performance-assessment function there needs to be a more structured approach to ensuring that higher level models that have their basis in lower level models are linked so that a change in the one is reflected by a change in the other. If there isn't continual development and refinement of models at the lower reaches of the pyramid, the credibility and technical basis of models at the higher end of the pyramid will begin to erode. A recommendation was made for sufficient funding to allow for a credible and appropriately comprehensive performance-assessment program.

Work is needed in the area of fracture network modeling for both the saturated and unsaturated zones. The bounding "Weeps" model illustrates the need for site data to define the role of fracture flow in transporting radionuclides through the unsaturated zone.

At the technical level, there were detailed recommendations made between analysts. These ranged from identifying plausible data sources to suggesting alternative numerical methods. Some of these recommendations were accepted and many were rebutted as part of the lively exchanges between performance-assessment practitioners that took place informally in the meeting and especially at breaks and during noon and evening recesses.

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ATTACHMENT B

TOTAL SYSTEM PERFORMANCE ASSESSMENT REVIEW MEETING

101 Convention Center Drive, Phase 2
Yucca Mountain Project Office
Large Conference Room
Las Vegas, 18-20 November 1991

Day 1

Topic	Speaker	Duration	Start
Introduction - Participants - Purpose of meeting	Dyer/Boak	20 min	1:30
Overview & Discussion of Golder work	Miller	40 min	1:50
Overview & Discussion of EPRI work	Shaw	40 min	2:30
Overview & Discussion of the "ESSE" total system evaluation	Rickertson	40 min	3:10
Overview & Discussion of LLNL system model	Halsey	40 min	3:50
Overview of Days 2 and 3			
- Overview of SNL work	Bingham	15 min	4:30
- Overview of PNL work	Eslinger	15 min	4:45
Adjournment			5:00

Day 2

Topic	Speaker	Duration	Start
Welcome for additional participants	Boak	15 min	8:45

ATTACHMENT B

TOTAL SYSTEM PERFORMANCE ASSESSMENT REVIEW MEETING

Day 2 - continued

Topic	Speaker	Duration	Start
Overview - 6-step method, SCP process - reasons for simplification, the pyramid - CCDF construction method	Bingham	40 min	9:00
Break		20 min	9:40
Analysis Setup and Results			
- Basic data set (domain, boundary conditions, etc.)	Dockery	15 min	10:00
- Development of Geohydrological parameter distributions	Kaplan	15 min	10:15
- Source term			
1) LLNL assumptions of source-term model	O'Connell	20 min	10:30
2) SNL source-term implementation	Wilson	20 min	10:50
3) PNL source-term implementation	Engel	20 min	11:10
- Geohydrologic & gas transport and results			
1) PNL detailed analysis (geohydrology)	Nichols	40 min	11:30
2) PNL detailed analysis (gas)	White	20 min	12:10
LUNCH		1 hour	12:30
- Geohydrologic & gas transport and results (continued)			
1) SNL abstract analysis (geohydrology)	Wilson	30 min	1:30
2) SNL abstract analysis (gas)	Wilson	30 min	2:00

Day 2 - continued

Topic	Speaker	Duration	Start
- Human-intrusion component and results			
1) PNL - detailed	Eslinger	30 min	2:30
2) SNL - abstract	Barnard	30 min	3:00
- Volcanism component and results			
1) SNL	Dockery	25 min	3:30
2) PNL	Murphy	15 min	3:55
BREAK		20 min	4:10
- Tectonics component and results (PNL)	Rohay	20 min	4:30
- Complete CCDF			
1) Construction of a combined CCDF (SNL)	Wilson	20 min	4:50
2) Construction of a combined CCDF (PNL)	Eslinger	20 min	5:10
Adjournment			5:30

Day 3

Topic	Speaker	Duration	Start
Analysis and Comparison			
- SNL sensitivity studies	Dockery	30 min	8:30
- PNL sensitivity studies	Eslinger	30 min	9:00
Comparison of abstract and detailed calculational results	Barnard/ Group	45 min	9:30
BREAK		15 min	10:15

ATTACHMENT B

TOTAL SYSTEM PERFORMANCE ASSESSMENT REVIEW MEETING

Day 3 - continued

Topic	Speaker	Duration	Start
Comparison of abstract and detailed calculational results (continued)	Barnard/ Group	30 min	10:30
Dose Calculations			
- Methods & results (PNL)	Miley	1 hour	11:00
- Comparison with NRC & EPA methods (SNL)	Wilson	20 min	12:00
LUNCH		1 hour	12:20
- Lessons learned from abstraction (SNL)	Wilson	40 min	1:20
- Lessons learned from modeling done (PNL)	Eslinger	20 min	2:00
BREAK		20 min	2:20
Discussion and Summary			
- Alternate conceptual models	Andrews/Group	1 hour	2:40
- Structuring a total system assessment	Pahwa/Group	1 hour	3:40
Adjournment			4:40