LSNReviews

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Subject: FYI: Attached on postclosure risk-informing guidance will be presented to SIR tomorrow
Attachments: guidance and training for riskinformed review of PA_SIR.ppt

Folks,
This went out to SIR team late yesterday. Jim R (PM post-closure) and I thought you and your team should be aware of the presentation as it affects all parts of the postclosure review. I will also mention it in the Yucca team meeting this AM.
CHeers,
bret

Properties Page

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Date: Wed, 12 Apr 2006 08:24:58 -0400
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Guidance and Training for Risk-Informed Review of Performance Assessment

Bret Leslie, Technical Team Lead (TSPAI1: System Description and Demonstration of Multiple Barriers & TSPAI2: Scenario Analysis (FEPs) and Probability Teams)

Femi Osidele Center PI (TSPAI1)

Chris Grossman and Keith Compton

Safety Integration Review Team Meeting April 13, 2006

Presentation Outline

- Introduction and objectives
- Overall framework of performance assessment
- Development of review strategies
- Approach of guidance and training
- Guidance
- Training
- Summary and path forward

Introduction

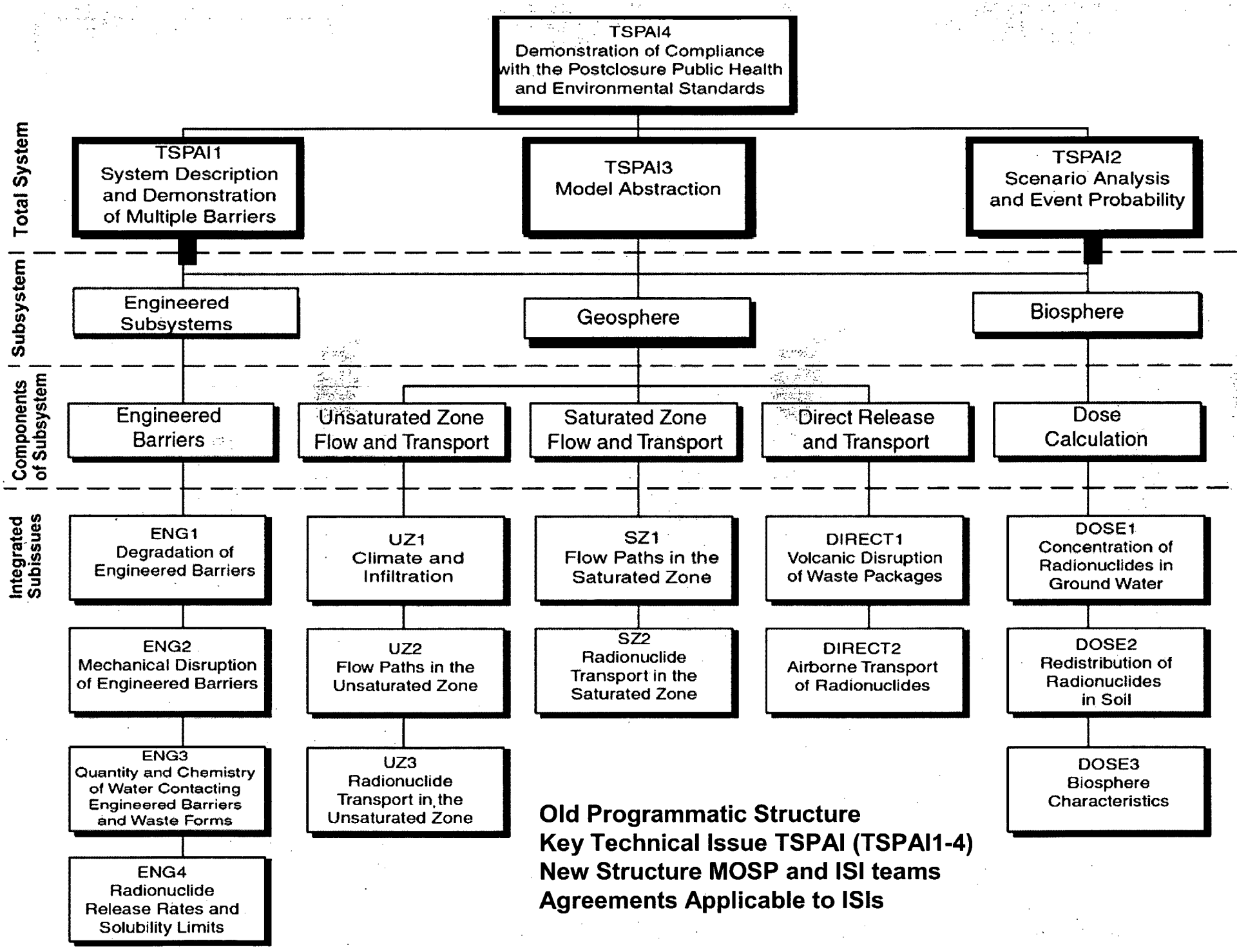
- Review strategies for model abstraction (TSPAI3) teams need to be completed by 9/06, and issues common to all teams need to be addressed as part of those strategies
- Management identified need for guidance on a risk-informed review of performance assessment
- SIR team had wanted a future session on ongoing LSO sessions
- Each of these topics are addressed herein

Objectives

- Describe guidance and training that would ensure a better integrated, more risk-informed and performance-based review of all aspects of the performance assessment
- Get SIR feedback today on scope and schedule, and path forward for common issues
- Get SIR approval today to proceed with guidance and training

Overall Framework of a Performance Assessment

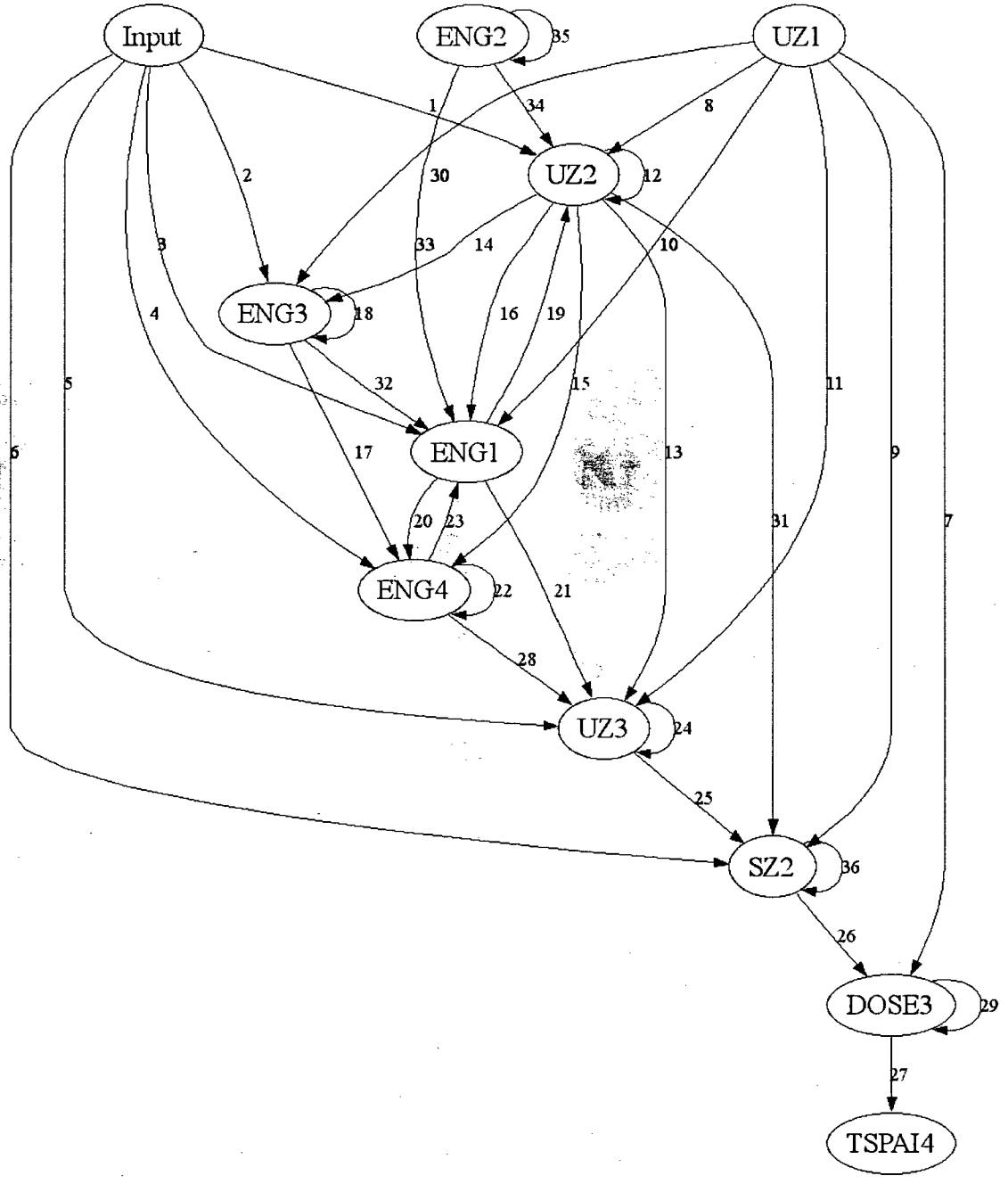
- Review framework of performance assessment specified in Yucca Mountain Review Plan
- Review framework developed from 4 sub-issues of Total System Performance Assessment & Integration (TSPAI) key technical issue
  - Multiple barriers
  - Scenario analysis (FEPs) and probability of scenarios
  - Model abstraction issues
  - Demonstration of compliance with standards


TSPAI4
Demonstration of Compliance with the Postclosure Public Health and Environmental Standards
Total System
TSPAI1
System Description and Demonstration of Multiple Barriers
TSPAI3
Model Abstraction
TSPAI2
Scenario Analysis and Event Probability
Subsystem
Engineered Subsystems
Geosphere
Biosphere
Components of Subsystem
Engineered Barriers
Unsaturated Zone Flow and Transport
Saturated Zone Flow and Transport
Direct Release and Transport
Dose Calculation
Integrated Subissues
ENG1
Degradation of Engineered Barriers
UZ1
Climate and Infiltration
SZ1
Flow Paths in the Saturated Zone
DIRECT1
Volcanic Disruption of Waste Packages
DOSE1
Concentration of Radionuclides in Ground Water
ENG2
Mechanical Disruption of Engineered Barriers
UZ2
Flow Paths in the Unsaturated Zone
SZ2
Radionuclide Transport in the Saturated Zone
DIRECT2
Airborne Transport of Radionuclides
DOSE2
Redistribution of Radionuclides in Soil
ENG3
Quantity and Chemistry of Water Contacting Engineered Barriers and Waste Forms
UZ3
Radionuclide Transport in the Unsaturated Zone
DOSE3
Biosphere Characteristics
ENG4
Radionuclide Release Rates and Solubility Limits
Old Programmatic Structure
Key Technical Issue TSPAI (TSPAI1-4)
New Structure MOSP and ISI teams
Agreements Applicable to ISIs

Review Strategies

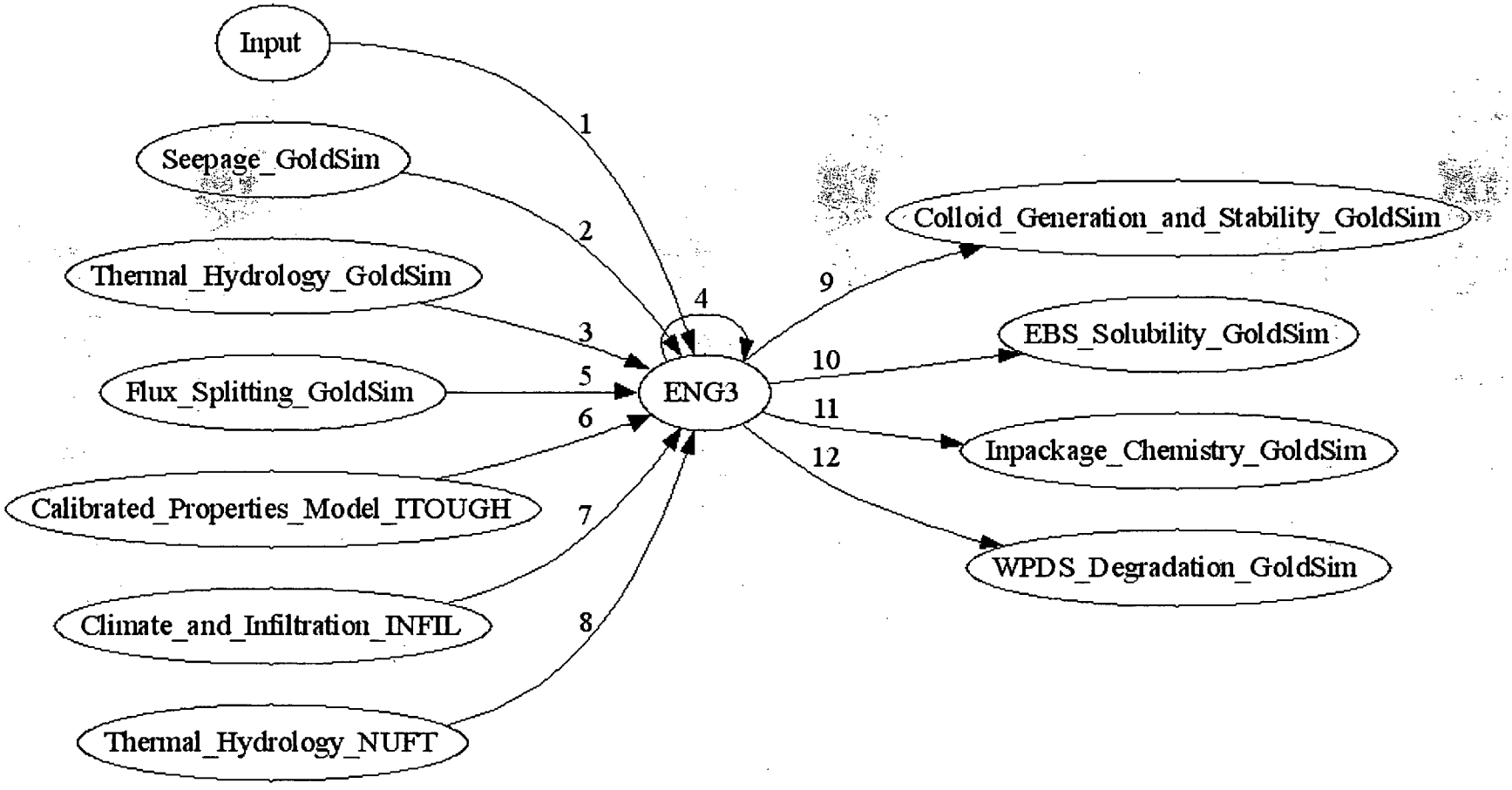
- Strategies for barriers and scenario analysis (SIR-8/05) are being implemented
- Model abstractions strategies in development
- Common issues to be addressed
  - Risk-informed review of FEPs
  - Risk-informed review of model abstractions
  - Focus on review of performance assessment
  - Consistency in application of generic acceptance criteria
  - Scope of review team's review (who is responsible)

Conceptual Map of TSPA represented using YMRP Abstraction Groups



Example: Input/Output Diagram for ENG3

(Review Team for Quantity and Chemistry of Water Contacting Waste Packages and Waste Forms)



DOE's performance assessment is the starting point for multiple barrier, scenario analysis, and model abstraction teams

Approach for Training and Guidance

- Mutually reinforcing activities
- Focused on assisting model abstraction team's understanding of risk-informed, performance assessment focused, review
- 2-way communication and learning
- Integrated schedule that can be incorporated into pre-licensing project plan, applied to FY06 metrics, and incorporated into FY07 operation plans

Guidance

- Use interim staff guidance to YMRP
  - To focus teams on review of overall performance assessment (modification or deletion of language)
  - Further describe use of risk informed baseline report and DOE license application as basis for risk-informed review
  - Provide more detail how to conduct risk-informed
    - Review of scenario analysis (FEPs) and probability
    - Review of model abstractions within 2.2.1.3.x

Guidance (continued) Add to YMRP 2.2.1 & 2.2.1.3

- **Risk informed approach (logic) and performance assessment focus within model abstractions sections**

NRC RIBR	DOE LA	Review Focus
H	H	H
H	L	M
L	H	H
L	L	L

Guidance (continued) 2.2.1.2.x and 2.2.1.3.x

- Currently wording can be interpreted prescriptively, as if checklist
- Revise through numerous, but minor, changes in wording
  - Add modifying language such "important"
  - Delete wording that is prescriptive (e.g. incorporation of criticality in model abstraction sections)
- Update example in Appendix A1.2.4

Guidance (continued) Risk Insights Baseline Report

- Updated in FY 07 thru activities by model abstraction teams in FY06 and FY07
  - As part of the training exercises
  - Ownership by individual review teams for the risk insights within their scope
  - Help to focus review teams on those things that are important to waste isolation
  - Measurable progress in risk-informing effort

Guidance (continued) Schedule

Topic	Date
Draft ISG to Teams	Late May
Draft ISG to SIR	Late June
ISG Federal Register	August
Technical Exchange	September
Incorporated into YMRP	6 months after Part 63
Update to RIBR	FY07Q3

Training

- Multiple types of activities: lectures; hands on; and elicitation
- Focused on multiple topics
  - TSPAI agreements applicable to all teams
  - Working with TPA code to develop new risk insights
  - Understanding DOE's implementation of TSPA models
  - Explaining the guidance through examples

Training (continued)

- LSO Sessions on TSPA-LA
  - Identification of where DOE is taking credit
  - Treatment and propagation of uncertainty
- TPA Analyses
  - Validation activities
  - Sensitivity studies
- Lectures
  - Relevant PA topics (e.g. propagation of uncertainty)
  - TSPAI agreements
- Elicitation Seminars
  - Facilitating dialog between TSPAI1 & 2 and ISI teams

Training - Details

Scope/Focus	Goal	How	Timing /duration/ #sessions
Multiple Barriers DOE's approach	Learn DOE's implementation in TSPA-LA	Hands on at LSO	FY06Q3 / half day / (~13)
Treatment of uncertainty and variability in TSPA	Identify methods used to address uncertainty and variability	LSO Seminar Series	FY07Q1 / half day / (~13)
TSPA Model Support Seminars	Identify evidence that corroborates individual model components	LSO Seminar Series	FY07Q3 / half day / (~13)

Training Details (continued)

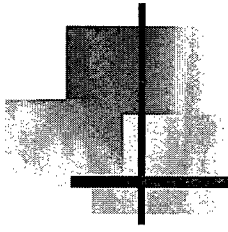
Use of intermediate results from TSPA	Examples of how intermediate results in TSPA-FEIS can be used to increase understanding	Lecture	FY06Q4 / 2 hr/ 1 session
Multiple Barriers DOE's approach	Common understanding across all teams	Lecture	June 06/ 2.0 hr /1 session
Model Validation, and uncertainty acceptance criteria	Common understanding of TSPAI agreements	Lecture	July 06/ 2.0 hr/ 1 session
Use of multiple barrier and risk information	Verify common understanding	Elicitation seminar series	FY06Q4 / 30 min/ ~ 13 sessions
TPA 5.1 validation exercise	NRC staff to become familiar with TPA by identifying analyses to conduct to obtain risk info	Hands on	FY06Q3 & FY06Q4
Use TPA 5.1 to develop risk insights	Develop input for revising RIBR	Hands on	FY07Q1

Integrated Schedule

Action	Date
Multiple Barriers - DOE's approach (hands on session at LSO)	FY06Q3
TPA 5.1 validation exercise (hands on exercise with TPA code)	FY06Q3-Q4
Draft ISG to Teams	Late May 06
Multiple Barriers - DOE's approach (summary lecture)	June 06
Draft ISG to SIR	Late June 06
Model validation, and uncertainty acceptance criteria (lecture)	July 06
Use of intermediate results from TSPA (lecture)	FY06Q4
ISG Federal Register	August 06
Technical Exchange	September 06
Use of multiple barrier and risk information (elicitation seminar)	FY06Q4
Treatment of uncertainty and variability in TSPA (hands on sessions at LSO)	FY07Q1
Use TPA 5.1 to develop risk insights	FY07Q1
Draft RIBR delivered by Center	FY07Q2 (?)
TSPA Model Support Seminars (hands on at LSO)	FY07Q3
ISG Incorporated into YMRP	Within 6 months after Part 63
Update to RIBR published on web	FY07Q3 (?)

Summary and Path Forward

- Described integrated guidance and training that would ensure a better integrated, more risk-informed and performance-based review of all aspects of the performance assessment
- Get SIR feedback today on scope and schedule, and path forward for common issues
- Get SIR approval today to proceed with guidance and training



Background Slides

2.2 Repository Safety After Permanent Closure

2.2.1 Performance Assessment

Risk-Informed Review Process for Performance Assessment—The performance assessment quantifies repository performance, as a means of demonstrating compliance with the postclosure performance objectives at 10 CFR 63.113. The U.S. Department of Energy performance assessment is a systematic analysis that answers the triplet risk questions: what can happen; how likely is it to happen; and what are the consequences. The Yucca Mountain performance assessment is a sophisticated analysis that involves various complex considerations and evaluations. Examples include evolution of the natural environment, degradation of engineered barriers over a 10,000-year period, and disruptive events, such as seismicity and igneous activity. The staff needs to consider the technical support for models and parameters of the performance assessment, based on detailed process models, laboratory and field experiments, and natural analogs. In their evaluation of the technical support for models and parameter distributions, the staff will consider the implications for the repository system and the effects on the calculated dose. Because the performance assessment encompasses such a broad range of issues, the staff needs to use risk information throughout the review process. Using risk information will ensure the review focuses on those items most important to waste isolation.

Section 2.2.1 requires the staff to apply risk information throughout the review of the performance assessment. First, the staff reviews the barriers important to waste isolation in Section 2.2.1.1. The U.S. Department of Energy must identify the important barriers (engineered and natural) of the performance assessment, describe each barrier's capability, and provide the technical basis for that capability. This risk information describes the U.S. Department of Energy understanding of each barrier's capability to prevent or substantially delay the movement of water or radioactive materials. Staff review of the U.S. Department of Energy performance assessment—first the barrier analysis and later the rest of the performance assessment—considers risk insights from previous performance assessments conducted for the Yucca Mountain site, detailed process modeling efforts, laboratory and field experiments, and natural analog studies. The result of the initial multiple barrier review is a staff understanding of each barrier's importance to waste isolation, which will influence the emphasis placed on the reviews conducted in Sections 2.2.1.2, "Scenario Analysis and Event Probability" and 2.2.1.3, "Model Abstraction." The emphasis placed on particular parts of the staff review will change based on changes to the risk insights or in response to preliminary review results.

Scenario analysis and model abstraction are the key attributes of the performance assessment. The risk information, drawn from the review of the multiple barriers section, will direct the staff review to those topics within scenario analysis and model abstraction that are important to waste isolation. Section 2.2.1.2 provides the review methods and acceptance criteria for scenarios for both nominal and disruptive events. An acceptable scenario selection method includes identification and classification, screening, and construction of scenarios from the features, events, and processes considered at the Yucca Mountain site. Then, it is necessary to review abstracted models used in the performance assessment for the retained scenarios. The performance assessment review focuses on the 14 model abstractions in Section 2.2.1.3 and the implementation of the model abstractions in the total system

Slide 22 -23 are Pages 2.2-1 through 2.2-3 form NUREG-1804, Revision 2, Yucca Mountain Review Plan

Additional information to be added on relationship of RIBR and DOE license appllication

Additional detail to be added on relationship of excluded FEPs review to performance assessment

performance assessment model. These model abstractions stemmed from those aspects of the engineered, geosphere, and biosphere subsystems shown to be most important to waste isolation, based on prior performance assessments and knowledge of site characteristics and repository design. The staff developed each of the fourteen model abstraction sections in substantial detail, to allow for a detailed review. However, it is unlikely that each of the abstractions will have the same risk significance. The staff will review the abstractions according to the risk significance determined in the multiple barrier review, using Section 2.2.1.1. Nevertheless, until the U.S. Department of Energy completes its license application, the review plan sections dealing with model abstractions must remain flexible and in enough detail, so that the U.S. Department of Energy will understand how the U.S. Nuclear Regulatory Commission will conduct the reviews .

The review of the model abstraction process begins with the review of the repository design and the data characterizing the geology and the performance of the design and proceeds through the development of models used in the performance assessment. The model abstraction review process ends with a review of how the abstracted models are implemented in the total system performance assessment model (e.g., parameter ranges and distributions, integration with model abstractions for other parts of the repository system, representation of spatial and temporal scales, and whether the performance assessment model appropriately implements the abstracted model). Reviews conducted on the early stages of the model abstraction process will be influenced by the final application of the information. For example, the review of parameter distributions will consider the relevant data, the corresponding uncertainty, and effects on the performance of the repository (i.e., the dose to the reasonably maximally exposed individual). The potential for risk dilution—the lowering of the risk, or dose, from an unsupported parameter range and distribution—will also be part of this review of model abstraction.

An unwanted risk dilution can easily result, if care is not exercised in selecting parameter ranges. For example, the parameter range for the retardation factor of a particular radionuclide could be expanded beyond that found in the supporting data in an effort to represent uncertainty. This expanded range could increase the spread in calculated arrival time for the radionuclide and, consequently, result in a smaller expected annual dose. The staff will review parameter ranges and distributions to evaluate whether they are technically defensible, whether they appropriately represent uncertainty, and the potential for risk dilution.

In many regulatory applications, a conservative approach can be used to decrease the need to collect additional information or to justify a simplified modeling approach. Conservative estimates for the dose to the reasonably maximally exposed individual may be used to demonstrate that the proposed repository meets U.S. Nuclear Regulatory Commission regulations and provides adequate protection of public health and safety. Approaches designed to overestimate a specific aspect of repository performance (e.g., higher temperatures within the drifts) may be conservative with respect to temperature but could lead to nonconservative results with respect to dose. The total system performance assessment is a complex analysis with many parameters, and the U.S. Department of Energy may use conservative assumptions to simplify its approaches and data collection needs. However, a technical basis that supports the selection of models and parameter ranges or distributions must be provided. The staff evaluation of the adequacy of technical bases supporting models and parameter ranges or distributions will consider whether the approach results in calculated doses that would overestimate, rather than underestimate, the dose to the reasonably maximally exposed individual. In particular, the claim of conservatism as a basis for simplifying models and parameters should be carefully evaluated to verify that any simplifications are justified and do not unintentionally result in nonconservative results.

The intentional use of conservatism to manage uncertainty also has implications for the staff's efforts to risk-inform its review. The staff will evaluate assertions that a given model or parameter distribution is conservative from the perspective of overall system performance (i.e., the dose to the reasonably maximally exposed individual). The staff will use any available information to risk-inform its review. For example, if the U.S. Department of Energy were to use an approach that overestimates a specific aspect of repository performance, then the staff would consider the effects of this approach on other parts of the total system performance assessment model, overall repository performance, and the representation or sensitivity of important phenomena.