

U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

**NUCLEAR WASTE TECHNICAL REVIEW BOARD
FULL BOARD MEETING**

**SUBJECT: OVERVIEW OF TOTAL SYSTEM
PERFORMANCE ASSESSMENT (TSPA) II**

PRESENTER: DR. JEREMY M. BOAK

**PRESENTER'S TITLE
AND ORGANIZATION: CHIEF, TECHNICAL ANALYSIS BRANCH
U.S. DEPARTMENT OF ENERGY
LAS VEGAS, NEVADA**

**PRESENTER'S
TELEPHONE NUMBER: (702) 794-7588**

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Outline

- **FY93 performance assessment priorities**
- **Major objectives of Total System Performance Assessment (TSPA) II**
- **Major participants and roles in TSPA II**
- **TSPA II schedule**

FY93 Performance Assessment Priorities

- **Analyses to support**
 - **ESF design and surface-based testing**
 - Waste isolation impact evaluations
 - **Alternative regulatory standards**
 - **System studies of**
 - Alternative thermal loads
 - Waste-package designs
 - Waste-emplacement modes
- **Continued development, verification, and validation of flow and transport codes and models**
- **Initiate TSPA II**

Major TSPA II Objectives

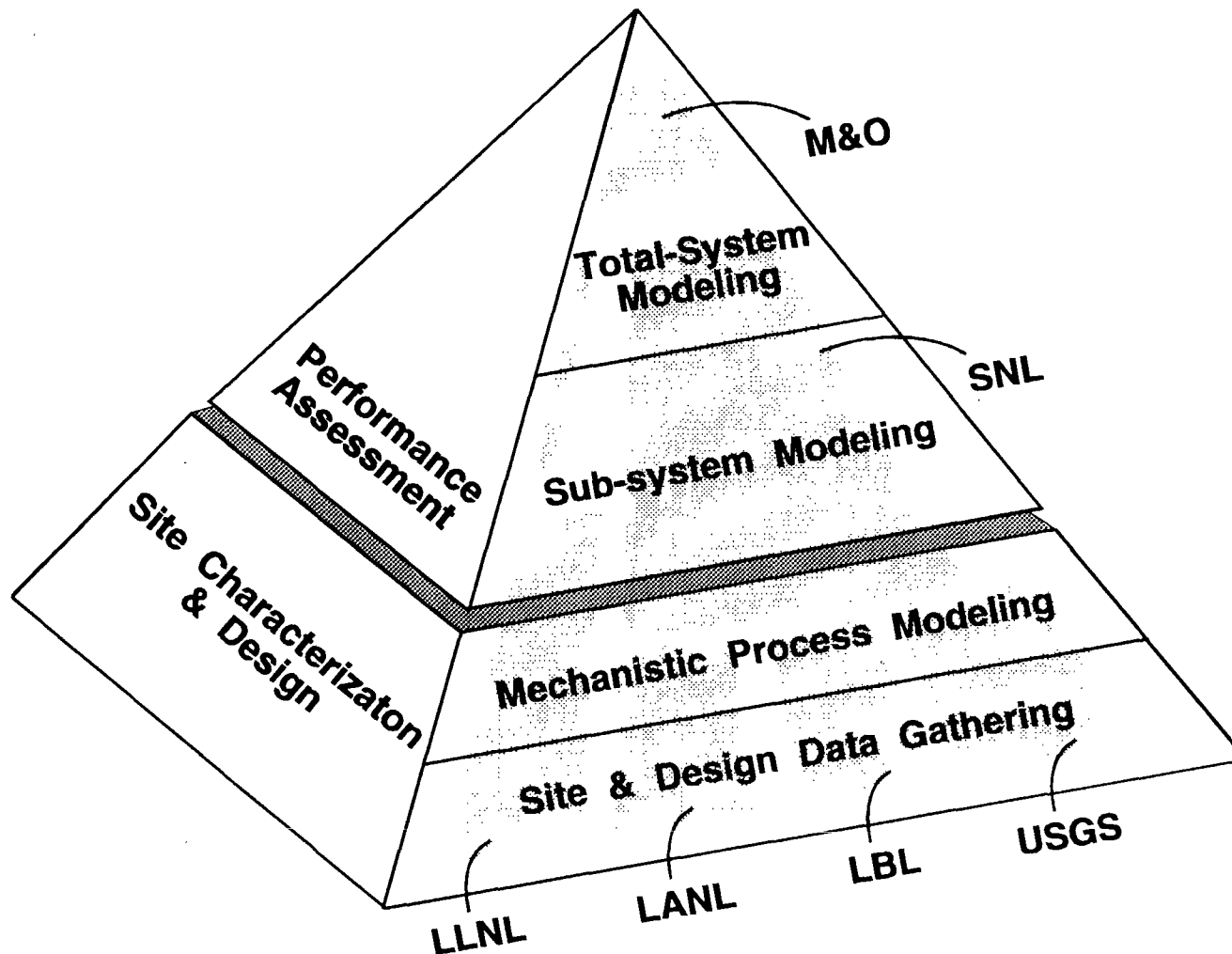
- **Evaluate effects of alternative**
 - **Thermal regimes**
 - **Emplacement modes**
 - **Waste-package designs**
- **Incorporate new site information**
- **Evaluate effects of alternative performance measures**
- **Conduct sensitivity/uncertainty analyses**

Alternative Designs to be Investigated in TSPA II

		Alternative Thermal Loads (kW/Ac)			
		28	57	78	114
Vertical emplacement SCP design			✓		✓
In-drift emplacement MPC		✓	✓	✓	✓

- Sensitivity studies to consider cladding behavior and DHLW glass

Participants and Roles in Total System Performance Assessment (TSPA) II



Comparison of Alternative TSPA Approaches

Organization	Model	Description
EPRI	IMARC	<ul style="list-style-type: none"> • Tree-type logic • Discrete probabilities and discrete properties
M&O (Golder)	RIP	<ul style="list-style-type: none"> • Direct simulation of possible "futures" • Stochastic sampling of properties • Determine sensitivity
SNL PNL NRC	TSA-TOSPAC SUMO IPA	<ul style="list-style-type: none"> • Define scenario class and probability • Stochastic sampling of properties • Accommodates more detail in process models • Determine sensitivity

Common Features in all TSPA Approaches

- **Require abstracted representations of complex physical-chemical processes**
- **Require elicitation to define conceptual model and parameter ranges**
- **Used to define sensitivity to conceptual model(s) and parameters**
- **Reliability depends upon validity of conceptual model(s) and parameters elicited**

Important Conceptual Differences Between TSPA II and TSPA-1991

- **Coupled thermal-hydrogeological processes for aqueous flow**
- **Enhanced radionuclide inventory, chain decay, and solubility modeling for transport**
- **Enhanced statistical and geostatistical correlations**
- **Testing of significance of fracture-matrix coupling**
- **Dependence of water-contact mode on flux and saturation history**
- **Consideration of multiple engineered barriers**

TSPA II Schedule

<u>Activity</u>	<u>Date</u>	<u>Organization</u>
Develop plan and define responsibilities	April 1993	M&O
“Test” RIP with TSPA-1991	April 1993	M&O
Define revised site characteristics, waste package, and emplacement designs	June 1993	M&O, USGS, LLNL
Revise and upgrade models	July 1993	M&O, SNL
Define thermally dependent parameter distributions	July 1993	LANL, LLNL
Define thermal-hydrologic regime	July 1993	LLNL, SNL, M&O

TSPA II Schedule

(Continued)

<u>Activity</u>	<u>Date</u>	<u>Organization</u>
Define source term	July 1993	LLNL, SNL
Complete TSPA analysis	Sept. 1993	M&O, SNL
Conduct additional sensitivity/ uncertainty analysis	Nov. 1993	M&O, SNL, LLNL
Complete supporting documents	Nov. 1993	M&O, SNL
Complete summary document	Jan. 1994	DOE, M&O, SNL

TSPA II Participants

<u>Participant</u>	<u>Role</u>
YMPO/TAB	<ul style="list-style-type: none">• Direction
CRWMS/M&O	<ul style="list-style-type: none">• Integrate final TSPA II document• “Test” Repository Integration Program (RIP)• Conduct TSPA analyses using RIP
SNL	<ul style="list-style-type: none">• Develop scope for TSPA II• Enhance gas phase, saturated zone, thermal, and aqueous models• Conduct TSPA analyses using TOSPAC
LLNL	<ul style="list-style-type: none">• Define thermal regime and thermally dependent properties• Determine waste package/EBS release

TSPA II Participants

(Continued)

<u>Participant</u>	<u>Role</u>
LBL	<ul style="list-style-type: none">• Define thermal hydrologic analyses
LANL	<ul style="list-style-type: none">• Define solubilities and retardation coefficients, including thermal dependencies
USGS	<ul style="list-style-type: none">• Define thermally dependent hydrologic properties and “ambient” percolation flux