WHAT ISN'T PERFORMANCE ASSESSMENT?

AN ELABORATE COMPUTER SIMULATION SYSTEM THAT, UNTOUCHED BY HUMAN HANDS, MAKES DECISIONS BASED ON INTRICATE COMPUTATIONAL MODELS APPLIED TO A SUITE OF DATA

WHY?

- PERFORMANCE ASSESSMENTS SUPPORT DECISIONS - THEY DO NOT MAKE DECISIONS
- DIFFERENT DECISIONS REQUIRE DIFFERENT SUPPORTING TOOLS
- COMPUTERS,ALTHOUGH USEFUL, ARE NOT MANDATORY
- "EXPERT OPINION" WILL ALWAYS FORM THE BASIS FOR PERFORMANCE ASSESSMENTS
- SIMPLE MODELS ARE OFTEN THE MOST APPROPRIATE TOOLS TO SUPPORT DECISIONS
YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
PERFORMANCE ASSESSMENT PROGRAM

OBJECTIVE

DEVELOP AND APPLY A SUITE OF ANALYTICAL TOOLS TO SUPPORT PERFORMANCE-RELATED DECISIONS THROUGHOUT THE LIFE OF THE PROJECT
PERFORMANCE ASSESSMENTS SUPPORT DECISIONS

- THE DECISIONS FACING THE YUCCA MOUNTAIN PROJECT WILL CHANGE OVER TIME

- DIFFERENT PERFORMANCE ASSESSMENT TOOLS WILL BE REQUIRED AT VARIOUS TIMES DURING THE LIFE OF THE PROJECT
SCHEMATIC OF SITE SUITABILITY EVALUATION PROCESS

DEVELOP APPROACH

SITE TESTING → SITE TESTING

PERFORMANCE ASSESSMENT → PERFORMANCE ASSESSMENT

SITE TESTING → SITE TESTING

PERFORMANCE ASSESSMENT → PERFORMANCE ASSESSMENT

SITE SUITABILITY DECISION n → SITE SUITABILITY DECISION n

SITE SUITABILITY DECISION 1

ABANDON

SITE SUITABILITY DECISION 2

ABANDON

SITE SUITABILITY DECISION n-1

ABANDON

"ENGINE" OF DATA EVOLUTION

SITE RECOMMENDATION, LICENSE APPLICATION, etc.
NEAR-TERM APPLICATIONS OF PERFORMANCE ASSESSMENT

- SUPPORT SITE SUITABILITY EVALUATIONS
- SUPPORT TESTING PRIORITIZATION EVALUATIONS
- REGULATORY INTERACTIONS (e.g., 40 CFR 191)
- SUPPORT STRATEGIC STUDIES
  - "HOT" VS "COOL" FUEL
  - PARTITIONING/TRANSMUATION
- SUPPORT DESIGN TRADE-OFF STUDIES
- SUPPORT TEST AND EVALUATION PROCESS
  - SPECIFY/EVALUATE TEST CONTROLS
  - EVALUATE TEST RESULTS
POSSIBLE LONGER-TERM APPLICATIONS OF PERFORMANCE ASSESSMENTS

- SUPPORT WASTE PACKAGE AND REPOSITORY ADVANCED CONCEPTUAL DESIGN AND LICENSE APPLICATION DESIGN
- ENVIRONMENTAL IMPACT STATEMENT
- SITE RECOMMENDATION
- SAFETY ANALYSIS REPORT/LICENSE APPLICATION
- PERFORMANCE CONFIRMATION
LONGER-TERM PERFORMANCE ASSESSMENTS ADDRESS REGULATORY PERFORMANCE OBJECTIVES

- PRECLOSURE RADIOLOGICAL SAFETY
  - Radiation doses to members of the general public and repository workers from normal operations and accidents (10 CFR 60.111a)

- RETRIEVABILITY OF WASTE
  - Preserve option of retrieval of waste for up to 50 years after initiation of waste emplacement operations (10 CFR 60.111b)

- PERFORMANCE OF NATURAL BARRIERS
  - Pre-waste-emplacement ground-water travel time (10 CFR 60.113a(2))
LONGER-TERM PERFORMANCE ASSESSMENTS ADDRESS REGULATORY PERFORMANCE OBJECTIVES (CONTINUED)

- POSTCLOSURE PERFORMANCE OF ENGINEERED BARRIER SYSTEM
  - TIME OF WASTE CONTAINMENT WITHIN WASTE PACKAGES (10 CFR 60.113a1(ii)A)
  - RATE OF RADIONUCLIDE RELEASE FROM THE ENGINEERED BARRIER SYSTEM (10 CFR 60.113a1(ii)B)

- POSTCLOSURE PERFORMANCE OF TOTAL SYSTEM (10 CFR 60.112/40 CFR 191)
  - CUMULATIVE RELEASE OF RADIONUCLIDES TO ACCESSIBLE ENVIRONMENT
  - RADIATION DOSES TO MAXIMALLY EXPOSED INDIVIDUAL
  - CONCENTRATIONS OF RADIONUCLIDES IN SPECIAL SOURCES OF GROUNDWATER
ASSESSING COMPLIANCE WITH REGULATORY PERFORMANCE OBJECTIVES

1. DEVELOP SCENARIOS
   • IDENTIFY SIGNIFICANT FEATURES, EVENTS AND PROCESSES
   • FORMULATE SCENARIO CLASSES
   • SELECT SCENARIOS FOR ANALYSES

2. ESTIMATE PROBABILITIES

3. DEVELOP MODELS
   • FORMULATE CONCEPTUAL MODELS
   • SELECT MATHEMATICAL MODELS AND COMPUTER CODES

4. IDENTIFY PARAMETER VALUES AND DISTRIBUTIONS

5. CONDUCT ANALYSES

6. INTERPRET AND EVALUATE RESULTS
THE HIERARCHY OF MODELS

SIMPLEST
- FOR MULTIPLE PROBABILISTIC MODELING
- ALL IMPORTANT FEATURES OF LOWER MODELS

OF INTERMEDIATE COMPLEXITY
- FOR SYSTEM MODELING
- ALL IMPORTANT FEATURES OF LOWER MODELS

MOST DETAILED
- FOR UNDERSTANDING PHENOMENA AS COMPLETELY AS POSSIBLE