

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

**PRESENTATION TO  
THE NUCLEAR WASTE TECHNICAL REVIEW BOARD**

**SUBJECT: OVERVIEW OF PERFORMANCE  
ASSESSMENT**

**PRESENTER: DR. J. RUSSELL DYER**

**PRESENTER'S TITLE  
AND ORGANIZATION: CHIEF, TECHNICAL ANALYSIS BRANCH  
YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT OFFICE  
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# **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**

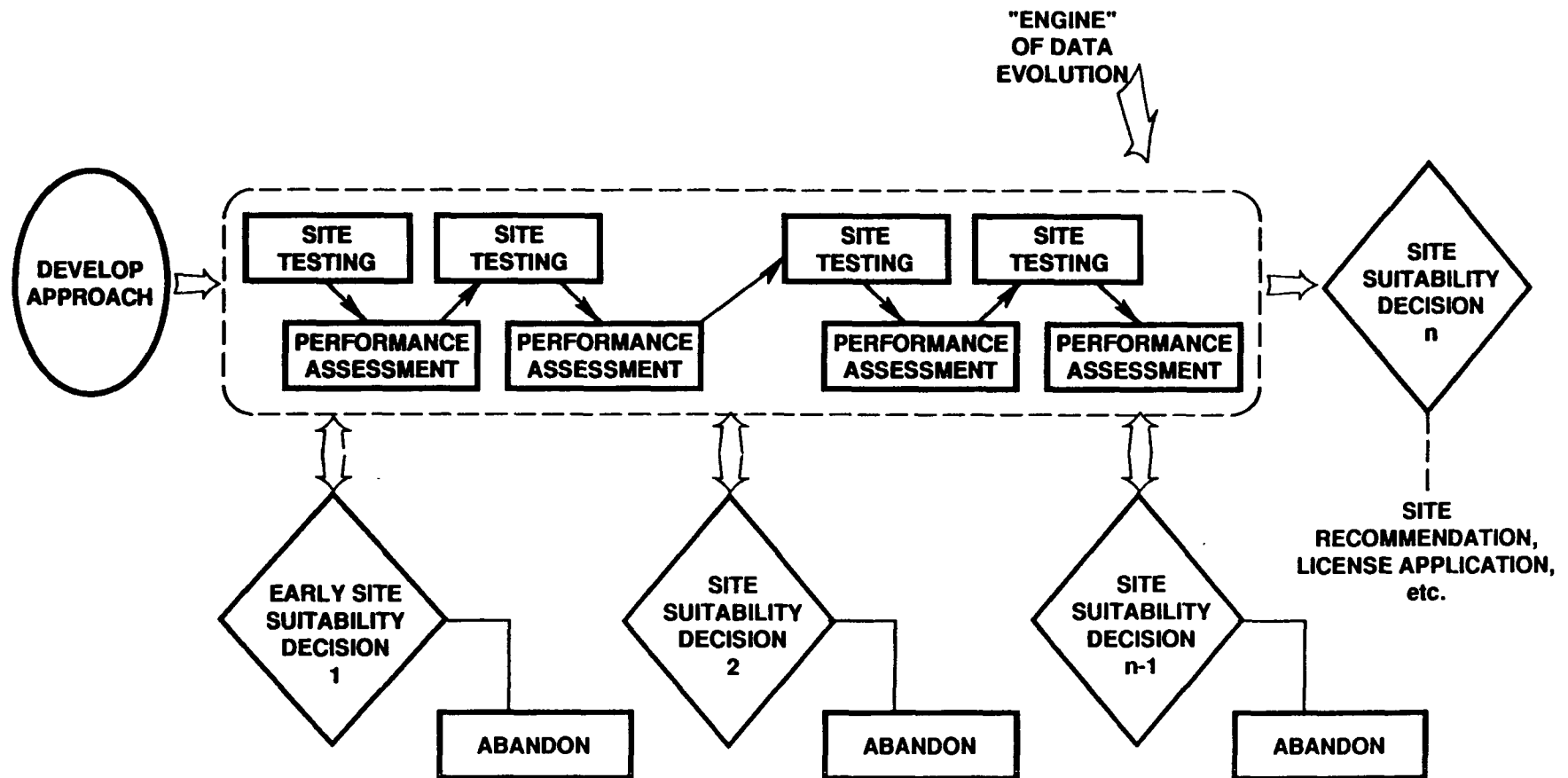
**OBJECTIVE**

**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



# **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/TRANSMUTATION
- **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**

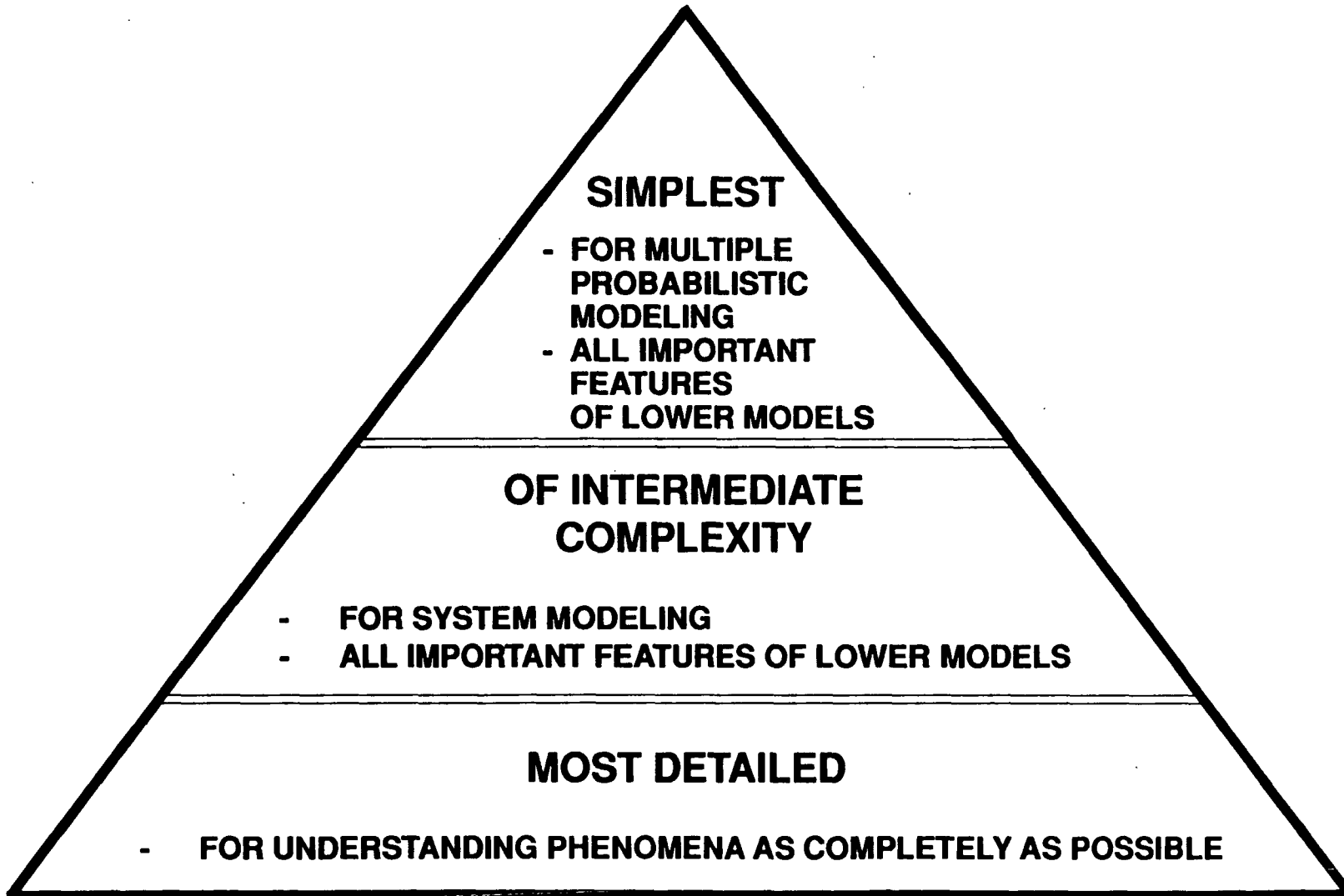
- **FORMULATE CONCEPTUAL MODELS**
- **SELCT MATHEMATICAL MODELS AND COMPUTER CODES**

## **4. IDENTIFY PARAMETER VALUES AND DISTRIBUTIONS**

## **5. CONDUCT ANALYSES**

## **6. INTERPRET AND EVALUATE RESULTS**

# THE HIERARCHY OF MODELS



# PERFORMANCE ASSESSMENT MODEL INTEGRATION

