

YUCCA  
MOUNTAIN  
PROJECT

Studies

# DOE Response to NRC's Total System Performance Assessment and Integration Issue Resolution Status Report

Presented to:  
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Total System Performance Assessment  
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# **Purpose of TSPA and Integration IRSR**

- **Issue Resolution Status Reports (IRSRs) “are the primary mechanism that the NRC staff will use to provide DOE with feedback on Key Technical Issue (KTI) sub-issues”**
- **The objective of the TSPA and Integration KTI and IRSR is to “describe an acceptable methodology for conducting assessments of repository performance and using these assessments to demonstrate compliance with the overall performance objective and requirement for multiple barriers”**

# **Status of TSPAI IRSR Development with Respect to Key Subissues**

## **1. Demonstration of Overall Performance Objective**

**Will be developed in Rev. 2**

## **2. Demonstration of Multiple Barriers**

**Will be developed in Rev. 2**

## **3. Model Abstraction**

**Rev. 0 discussed input analysis and model abstraction**

**Rev. 1 updates model abstraction acceptance criteria, review methods, and technical basis for acceptance criteria**

## **4. Scenario Analysis**

**Rev. 1 discusses acceptance criteria**

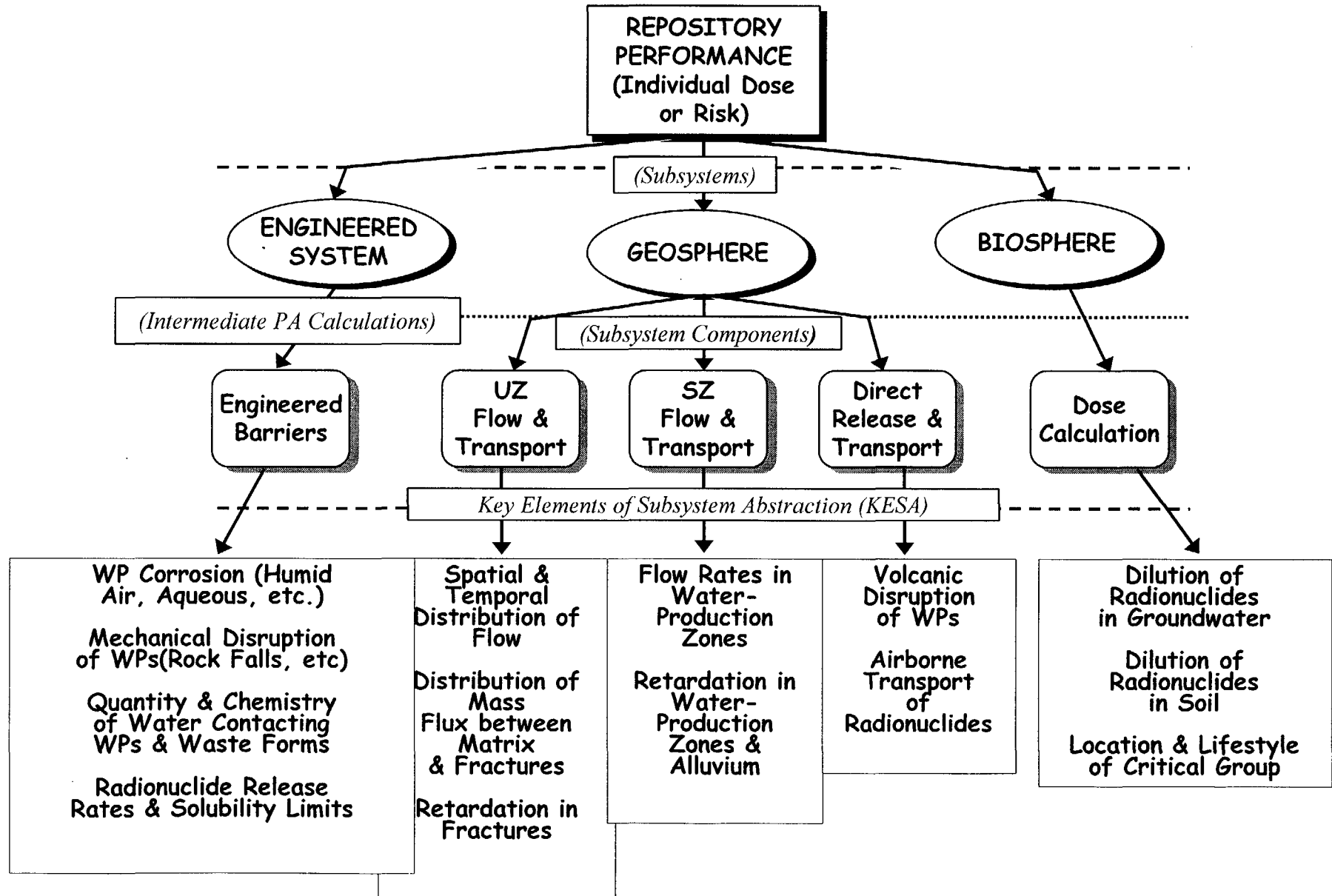
## **5. Transparency and Traceability of the Analyses**

**Will be developed in Rev. 2**

# Format of TSPAI IRSR

- **Organization of IRSR includes**
  - **2 Programmatic Acceptance Criteria**
    - » **P1- Appropriate QA procedures and qualification have been applied to data, models, or codes**
    - » **P2 - Expert elicitations can be used if conducted under acceptable procedures**
  - **5 Technical Acceptance Criteria**
    - » **T1- Data and Model Justification**
    - » **T2- Data Uncertainty and Verification**
    - » **T3- Model Uncertainty**
    - » **T4- Model Verification**
    - » **T5- Integration**
  - **14 Key Elements of Subsystem Abstraction (KESAs)**

# NRC Flowdown Diagram for TSPA



# **General Response to TSPA and Integration IRSR**

- **DOE concurs that the general approach and major topics addressed in the TSPAI IRSR are reasonable and complete**
- **The IRSRs have been very useful in helping focus technical work**
- **Most issues raised in this presentation involve requests for clarification on specific points**
- **Some elements of the IRSR have become moot due to design changes or model modifications; those issues are not addressed in this presentation**

# **Use of IRSRs in DOE Planning**

- The draft NRC Issue Resolution Status Reports have provided guidance in the development of the PA models and approach**
- Prioritization of future work in Volume 4 of the Viability Assessment was based, in part, on the appropriate IRSRs**
- IRSRs were used as a basis for identifying technical issues addressed in the PA Abstraction/Testing workshops, along with results of previous Yucca Mountain TSPAs and on NWTRB, ACNW, and PA Peer Review comments**

# **General Criterion P1**

- **Criterion P1: “the collection, documentation, and development of data, models and/or computer codes have been performed under acceptable QA procedures, or if the data, models and/or computer codes were not subject to an acceptable QA procedure, they have been appropriately qualified”**



# **Criterion P1 - Discussion**

- **Criterion P1, related to the adherence to appropriate procedures, clearly shows that one of the primary responsibilities of the DOE is to conduct work under adequate controls in order to demonstrate traceability, consistency, and sufficiency**
- **The DOE has committed itself to conducting work (including the TSPA) in a controlled environment**
- **Implementation of the PVAR procedures will help ensure that DOE will meet criterion P1**

# **General Criterion T1**

- **Data and Model Justification - “Sufficient data (field, laboratory, and/or natural analog) are available to adequately support the conceptual models, assumptions, boundary conditions and define all relevant parameters implemented in the TSPA”**

# **General Criterion T1 - Discussion**

- **Discussion:**
- **The criterion does not discuss what constitutes “sufficient” data**
- **The criterion does not recognize that some information - such as alternative conceptual models, model abstractions, and probability distributions - may be obtained by methods other than direct field or lab testing (i.e., expert elicitation, expert judgement)**

# General Criterion T1- Recommendations

## Recommendations for consideration:

- **Indicate that determination of “sufficiency” of information will depend on:**
  - whether additional information is more likely to simply corroborate previous results, or if the information is more likely to invalidate prior modeling results
  - how much a change in the information is likely to change the analysis results
- **Indicate in narrative that data or models be consistent with existing data (lab, field, and/or natural analog), or other information sources (i.e., expert judgement or expert elicitation)**

*possibility  
of information*

# **General Criteria T2 and T4**

- **T2 - “Data Uncertainty and Verification - Parameter values, assumed ranges, probability distributions, and/or bounding assumptions used in the TSPA are technically defensible and reasonably account for uncertainties and variabilities”**
- **T4 - Model Verification - “Models implemented in the TSPA provide results consistent with output of detailed process models or empirical observations or both”**

# **General Criteria T2 and T4 - Discussion and Recommendation**

## **Discussion:**

- **Use of “Verification” in title of criteria appears to be inconsistent with definition in NUREG-0856, which discusses the precision with which a computer code should reproduce test problems**

## **Recommendation for consideration:**

- **Eliminate the word “verification” from the titles of criteria T2 and T4. “Data Uncertainty and Consistency” and “Model Consistency” might be less ambiguous titles**

# **General Criterion T4 - Discussion and Recommendation**

## **Discussion:**

- **In some cases, YMP will be using direct output from process models as the “abstraction”. In other cases, the abstraction may be based on analog or other types of information or an expert elicitation rather than output from a process model**

## **Recommendation for consideration:**

- **Revise the criterion to include other methods for establishing the validity and reasonableness of TSPA models, such as technical review**

# **Scenario Analysis, Section 4.4 - Observation**

- **Minor inconsistencies in language between IRSR and proposed Part 63**
  - **Part 63 refers to “features, events, and processes; IRSR refers only to “events and processes”**
  - **This IRSR introduces the concept of screening on “credibility”, which is a term that does not appear in Part 63, in this context**



## **Scenario Analysis, Section 4.4.3**

- **Criterion T2 - “The probability assigned to each category of processes and events is consistent with site information; well documented, and appropriately considers uncertainty”**

# **Screening of Processes and Events, Section 4.4.3 - Discussion**

## **Discussion:**

- **As worded, this criterion could be interpreted to require probability estimates for all FEPs, regardless of their consequences. This is inconsistent with the intent of Criterion T4 in the same section, which allows the omission of FEPs if they do not significantly affect the expected annual dose**

# **Screening of Processes and Events, Section 4.4.3 - Recommendations**

## **Recommendations for consideration:**

- **Reorder criteria in Section 4.4.3 so that T2 (consistency of probability estimates) follows T3 and T4 (the probability and consequence screening criteria)**
- **Reword T2 so that it applies only when probability estimates are required, rather than under all circumstances**

# Summary

- **This IRSR has proven to be a very effective communication tool for conveying NRC expectations for development of the DOE TSPA**
- **The DOE has several general recommendations, including:**
  - **It would be useful to define “sufficiency” of information and models in terms of significance in determining compliance with the performance measure, as well as in terms of the likelihood of whether the information or data would corroborate rather than challenge modeling results**
  - **It would also be useful to recognize peer review as a valid method for assessing the representativeness and applicability of information and models**
- **The DOE is eager to receive information on Subissues 1, 2, and 5 that will be included in Rev. 2**