



U.S. Department of Energy  
Office of Civilian Radioactive Waste Management

# Introduction - Goals/Objectives of Supplemental Science and Performance Analyses

Presented to:  
**Nuclear Waste Technical Review Board**

Presented by:  
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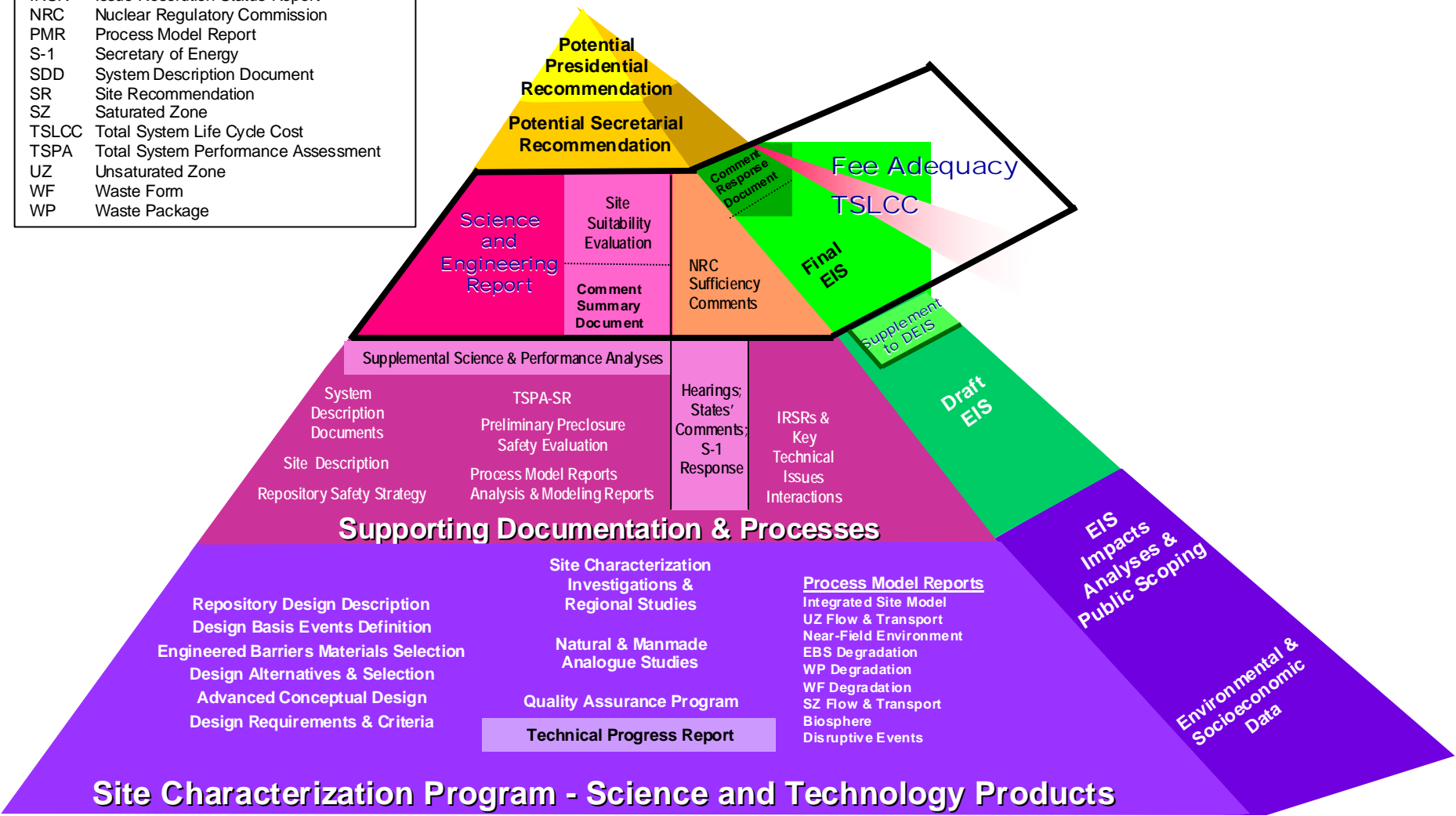
YUCCA  
MOUNTAIN  
PROJECT

# Outline

- **Site Recommendation (SR) document structure**
- **Supplemental Science and Performance Analyses (SSPA) - purpose and contents**
- **SSPA and the NWTRB four priority areas**
- **Follow on work**
- **Outline of the following talks**

# Site Recommendation Documentation Structure

AMR	Analysis/Model Report
DEIS	Draft Environmental Impact Statement
EBS	Engineered Barrier System
EIS	Environmental Impact Statement
FEIS	Final Environmental Impact Statement
IRSR	Issue Resolution Status Report
NRC	Nuclear Regulatory Commission
PMR	Process Model Report
S-1	Secretary of Energy
SDD	System Description Document
SR	Site Recommendation
SZ	Saturated Zone
TSLCC	Total System Life Cycle Cost
TSPA	Total System Performance Assessment
UZ	Unsaturated Zone
WF	Waste Form
WP	Waste Package



# Proposed Comprehensive Statement of the Basis for Recommendation

## YM Science & Engineering Report, Rev. 1

- NWPA 114(a)(1)(A)-(C)
- Reflects external comments on YMS&ER, Rev 0
- Update to YMS&ER, Rev 0
- Includes Executive Summary

## Final Environmental Impact Statement

- NWPA 114(a)(1)(D)
- Reflects external comments on the DEIS and Supplement
- Comment Response Document
- Includes Executive Summary

## NRC Sufficiency Comments

- NWPA 114(a)(1)(E)
- Includes NRC transmittal

## SR Comment Summary Document

- NWPA 114(a)(1) & (a)(1)(F)
- Summarizes public comments
- Contains states' views & comments
- Contains Secretary's response

## Site Suitability Evaluation

- NWPA 113(b)(1)(A)(iv)
- Reflects external comments on PSSE
- Includes Executive Summary

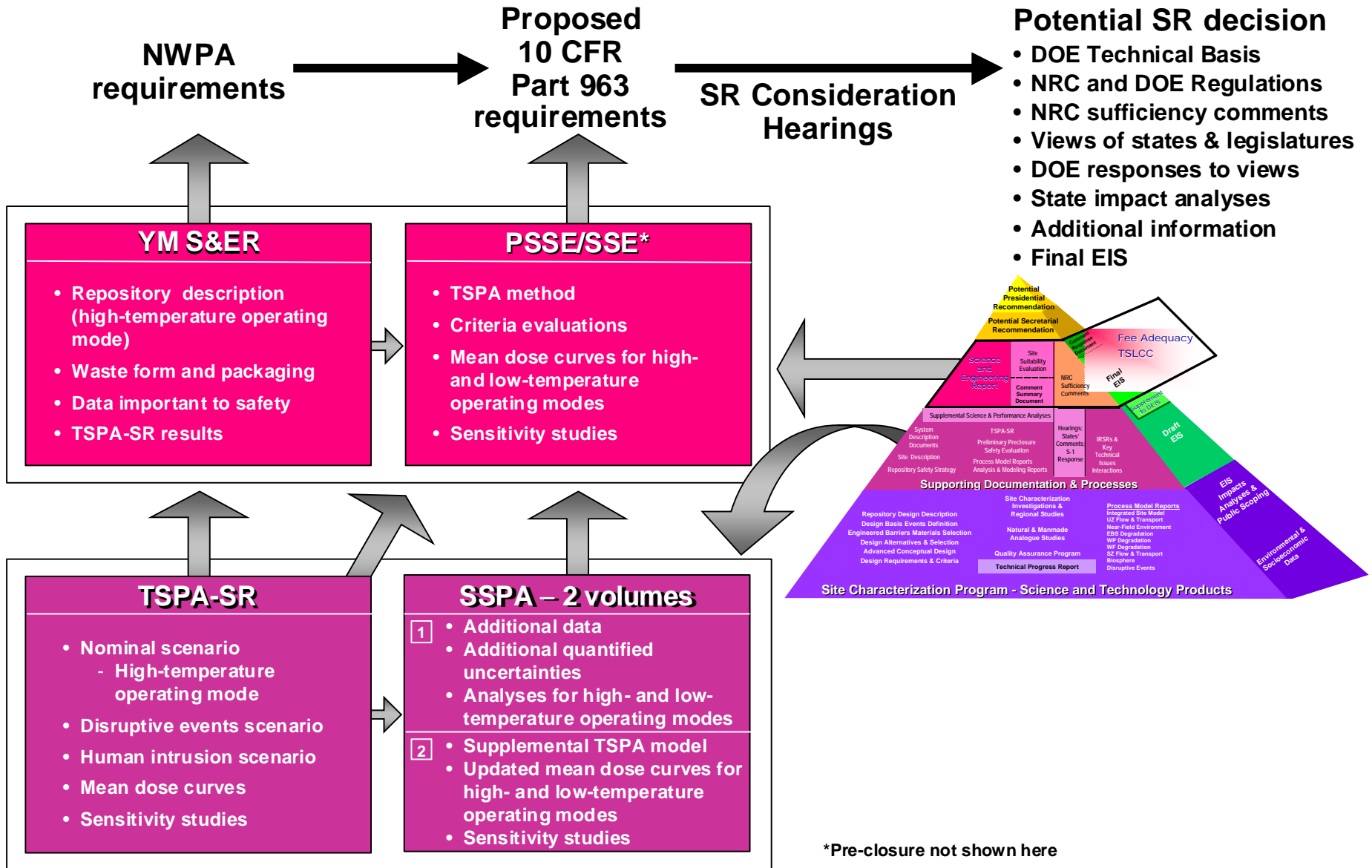
## Other Information

- NWPA 114(a)(1)(G)
- TSLCC & Fee Adequacy Report
- Other information Secretary considers appropriate

## Nevada Site Characterization Impacts Report

- NWPA 114(a)(1)(H)
- Any report from State on impacts from site characterization

# Roles and Relationships of SR Documentation



# Supporting Technical Documentation for SR

- **Technical Documentation supporting a potential SR decision**
  - **Total System Performance Assessment-Site Recommendation (TSPA-SR), Rev. 00, ICN 01**
  - **Analysis and Modeling Reports (AMRs) and Process Model Reports (PMRs)**
  - **System Description Documents**
  - **Draft Environmental Impact Statement (DEIS) and Supplement to the DEIS**
  - **Preliminary Site Suitability Evaluation**
  - **Yucca Mountain Site Description**
  - **Preliminary Pre-closure Safety Assessment**
  - **Supplemental Science and Performance Analyses Report**
    - ◆ **Represents work in progress**

# Evaluation of Operating Modes

- **SSPA evaluates the effect of thermal operating modes on system performance**
- **In selecting a thermal operating mode DOE will consider other issues including**
  - **Design parameters**
  - **Preclosure safety**
  - **Economic costs**
  - **Timeframes for construction, operation, ventilation, and closure**
- **An integrated evaluation and comparison of options will be prepared prior to the SR decision**

# SSPA- Purpose

- **Document new results for:**
  - **Quantification of uncertainties and conservatism**
  - **System and subsystem sensitivity analyses**
  - **Evaluating the effects of coupled processes over a range of thermal operating modes**
  - **Summarizing multiple lines of evidence**
  - **New science**



# SSPA - Content

- **SSPA Volume 1**
  - Unquantified uncertainty analysis
  - Update in scientific information
    - ◆ New data, analyses and models
  - Cooler thermal operating mode analysis
- **SSPA Volume 2**
  - Performance assessment sensitivity analyses
  - Supplemental TSPA model
    - ◆ High Temperature Operating Mode (HTOM)
    - ◆ Low Temperature Operating Mode (LTOM)

# NWTRB Priority Areas

- **Meaningful quantification of conservatisms and uncertainties in the DOE's performance assessments**
- **Progress in understanding the underlying fundamental processes involved in predicting the rate of waste package corrosion**
- **An evaluation and comparison of the base-case repository design with a low temperature design**
- **Development of multiple lines of evidence to support the safety case of the proposed repository. The lines should be derived independently of performance assessment and thus not subject to the limitations of performance assessment**

# Meaningful Quantification of Uncertainty and Conservatism-Nominal Performance

- **Supplemental model shows significantly wider ranges of doses at a given time and times to reach given doses**
- **After the first 10,000 years, the base case model appears to be conservative: the magnitude of the dose is less for the supplemental model and it occurs later in time**
- **During the period prior to 10,000 years, the supplemental model mean results are less than 0.00006 mrem/yr while the base case model are zero. Even though the difference between the models is very small, the base case model appears to be slightly non-conservative with respect to the supplemental model**

# Thermal Operating Mode

- **Significant differences observed at the subsystem level for some models**
- **System level performance essentially the same for the high temperature and low temperature operating modes**

# Corrosion Processes

- **Developed framework for conceptual model of long term passive film stability**
- **New information improved confidence in parameters and models**
  - **Stress corrosion cracking**
  - **Aging and phase stability**
- **Included model of temperature dependence of general corrosion**

# Multiple Lines of Evidence

- **Multiple Lines of Evidence (MLE) identified for most process and subsystem level models**
- **MLEs are independent of the TSPA**

# Summary Table

- **Identifies where specific topics are addressed in Volume 1**
- **Identifies topics that are analyzed in Volume 2**
- **Some potential topics are not addressed in the SSPA**

# Follow On Work

- **Exercise Supplemental TSPA Model**
- **Data Collection and Analysis Continues**
- **Guidance on the Treatment of Uncertainty**
- **Corrosion Processes Peer Review**
- **International TSPA Peer Review**
- **Manage, Communicate, Assess, and Analyze Uncertainties**



# List of Subsequent Talks

- **Overview/Introduction**
- **Details of process models (Volume 1)**
- **TSPA (Volume 2)**
- **Summary of NWTRB priority areas**