Framework for a Site Recommendation Decision

Presented to:
Nuclear Waste Technical Review Board (NWTRB)

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Presentation Outline

- Principles, process, and perspectives for Site Recommendation (SR) decision
- Remaining site characterization work
- Overall approach to enhancing the technical basis for evaluating site suitability and products available for a SR decision
- NWTRB questions and context for responses
- Other topics for discussion
- Summary
Fundamental Principles

- There are three fundamental principles that underlie the repository development process and influence DOE’s planning of scientific and design work:
  - **continuous learning**
    - understanding of site conditions and the behavior of the engineered system will continue to improve
  - **informed decision making**
    - decisions will be based on all relevant information
    - decisions can be revisited based on new information
  - **responsible stewardship**
    - DOE is responsible for all phases of the repository program, including monitoring and oversight after permanent closure
Fundamental Principles
(Continued)

- Siting (which includes site characterization and SR decision), licensing, constructing, operating, and closing a geologic repository will
  - require continuous information gathering and analyses
  - necessitate changes in approach and plans through time
  - take decades to complete
  - result in safe geologic disposal

- A critical point in the SR process is an evaluation of the suitability of Yucca Mountain for consideration as a possible geologic repository
Site Recommendation Process

- Under current planning evaluation of suitability will be based on the methods and criteria in DOE’s proposed suitability guidelines that will consider:
  - a comprehensive technical basis, including multiple lines of evidence and arguments
    - field and laboratory data and analyses
    - natural analogs
    - numerical analyses
  - performance assessment for the postclosure evaluation, consistent with NRC’s licensing criteria
  - comparison to applicable radiation protection standards for preclosure and postclosure performance
Site Recommendation Process

- SR process schedule has been extended to accommodate additional information to enhance the technical basis for a possible SR decision

- This additional information for a possible SR decision is planned to be completed during 2001
  - design with low-temperature operating mode
  - updated analysis/modeling reports reflecting the design changes
  - TSPA representing a lower-temperature operating mode and containing new site characterization information
  - identification and quantification of selected key unquantified uncertainties
Site Recommendation Process

**Site Characterization Information**

- Secretary conducts public hearings on possible site recommendation

- Secretary of Energy decides on whether to recommend site to President and notifies Nevada Governor and legislature of intent

- If recommended, no sooner than 30 days after notifying the Governor, the Secretary submits the recommendation to the President

**President Recommends the site to Congress**

- Within 60 days, Governor or legislature submits a notice of disapproval

- Governor or legislature does not submit a notice of disapproval within 60 days

**Site would be disapproved unless Congress passes a resolution of siting approval during the first 90 days of continuous session following disapproval**

**Site designation becomes effective**

**If Secretary or President does not recommend the site**

- Notify the Governor and immediately stop site characterization activities

- Secretary reports to Congress within six months on recommendations for further action
Perspectives for a SR Decision

- DOE’s proposed site suitability guidelines (10 CFR Part 963) are risk informed and performance based focusing on overall system performance and will
  - be consistent with NRC’s proposed licensing criteria (10 CFR Part 63)
  - include evaluation of the capabilities of individual barriers to better understand the performance of the overall system that will
    - identify uncertainties and quantify key unquantified uncertainties
    - recognize that some uncertainties will remain

- Information gathering (site characterization and test and evaluation) will continue throughout the life of the Project
Remaining Site Characterization Work

- External reviews of the site characterization program have identified concerns related to the technical basis for a possible recommendation of the Yucca Mountain site as a potential repository.

- Consistent with the program’s fundamental principles, these concerns are being addressed through ongoing and new tests and analyses.
Remaining Site Characterization Work

(Continued)

• The concerns identified are related to

  – quantification of uncertainties in TSPA, process models, and model abstractions
  – fundamental processes in understanding/predicting waste package corrosion
  – comparison and evaluation of base case design with lower-temperature operating mode
  – development of multiple lines of evidence and arguments for a safety case

• Addressing these concerns will improve the information available and our understanding of expected system performance to support an SR decision
Approach to Enhancing Technical Basis

- Ongoing work and new work being planned will address these concerns

- A revision of the multiyear plan is being prepared to address the new work
  - management and operating contractor is completing proposed change request for DOE review
  - plan will identify work to support SR decision as well as post SR, if site is recommended
Approach to Enhancing Technical Basis

(Continued)

- Revised plan may include additional testing and analyses
  - thermal/hydrologic/chemical (THC) testing and analyses
  - effort to quantify key uncertainties and develop more representative models
  - corrosion testing and analysis
  - radionuclide transport studies
  - engineered barrier and near-field environment studies
  - work to address agreements to close NRC’s Key Technical Issues
  - completing an updated TSPA that includes a lower-temperature operating mode
Proposed Additional Information Available for SR Decision

The following are examples of the supporting information planned to be available for SR decision:

- Evaluation of uncertainties, including summary report on the quantification of key unquantified uncertainties
- Improved descriptions of coupled process (THC) models, and integration with unsaturated zone, near-field environment, engineered barrier system, and coupled process Analysis/Model Reports
- Monte Carlo simulations for TSPA-SR based on revised seepage and THC models
- Incorporation of geothermal natural analogs in THC models
- Repository layout and ventilation analyses for lower-temperature operating mode
Proposed Additional Information Available for SR Decision
(Continued)

• Information for SR (continued)
  – waste package corrosion Analysis/Model Reports for lower-temperature operating mode
  – update selected System Description Documents for lower-temperature operating mode
  – peer review of current TSPA-SR
  – peer review of waste package materials performance
NWTRB Questions

- The NWTRB posed five questions to be discussed in this meeting that are related to
  - understanding and technical bases for the expected performance of particular natural and engineered barriers, and the significance of associated uncertainties (Questions 1, 2, & 3)
  - role of the waste package in the safety case and the potential impacts of early waste package failure on repository performance (Question 4)
  - design objectives and the relative importance of those objectives in selecting a repository design (Questions 5)
NWTRB Questions
(Continued)

• Each question will be specifically addressed in subsequent presentations that will focus on the scientific and technical basis
  – performance of the waste package will be discussed by Gerry Gordon (question 1)
  – performance of the unsaturated and saturated zones will be addressed by Bo Bodvarsson and Al Eddebarh (questions 2 and 3)
  – contribution of the natural and engineered barriers to system performance, including significance of early waste package failure will be discussed by Bob Andrews (question 4)
  – objectives for repository design will be discussed by Paul Harrington (question 5)
Context for Responses to NWTRB Questions

- DOE looks forward to the NWTRB comments on our responses
- Answers to these questions are based on data and analyses from site characterization activities
  - these data and analyses are the bases of our understanding of subsystem and system performance
  - assessments of subsystem or elements of subsystem performance represent the performance of that subsystem or element, but may not be representative of overall system performance
Context of NWTRB Questions 
(Continued)

- Additional information will be obtained to enhance the technical basis by addressing uncertainties and providing the basis for a more representative TSPA.

- Based on DOE’s proposed suitability guideline an evaluation of suitability will include:
  - assessment of overall system performance
  - a description of the expected performance of the individual barriers of the multi-barrier system
  - appropriate sensitivity studies, to better understand overall system performance
Other Topics for Discussion

- In addition to the NWTRB questions we will present information on the following
  - update on YMSCO’s scientific programs - Mark Peters
  - update on repository design - Paul Harrington
  - YMSCO’s approach to decision making in a learning environment - Russ Dyer
  - YMSCO’s approach to evaluation of uncertainties and status of that work - Bill Boyle
  - Repository Safety Strategy - Bill Boyle
Summary

- Development of a geologic repository is a lengthy process.
- Testing, design, and analyses will continue throughout repository development.
- Decision process is information-based and can be revisited based on new information.
- SR process has been extended to address certain internal issues and to address external concerns to enhance the technical basis for an SR decision.
Summary
(Continued)

- Ongoing and future testing and design will enhance our technical basis for an evaluation of site suitability and SR decision

- Answers to the five NWTRB questions are based on data and analyses from site characterization activities
  - these data and analyses are the bases of our understanding of subsystem and system performance
  - results from the assessment of subsystem or their elements represent the performance of that subsystem or element, but may not be representative of overall system performance