SUBJECT: THE EMERGING THERMAL LOADING STRATEGY

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LAS VEGAS, NEVADA
APRIL 19, 1995
Role of Thermal Management Strategy in Meeting Program Objectives

• Design a repository system for timely disposal of the desired amount of waste at acceptable cost

• Establish a thermal loading range that is compatible with preclosure and postclosure performance objectives

• Maintain flexibility to optimize design and performance during construction and performance confirmation
Program Evolution Related to Thermal Strategy

• Decision to utilize multi-purpose canister

• Program Approach implementation
  – Phased testing to manage resources and to provide demonstrable measures of progress
  – Step-wise site-suitability evaluation
  – Increased confidence to support licensing milestones

• Modeling, lab and field studies have refined the understanding of thermal effects
Key Topics Related to the Thermal Strategy

- Maintaining multiple hypotheses about the effects of thermal loading

- Analyzing a range of thermal loadings to support critical program milestones

- Prioritizing and scheduling the testing needed to evaluate thermal effects
Key Topics Related to the Thermal Strategy

(Continued)

• Balancing objectives of various repository system elements

• Evaluating the impacts associated with early decisions about multi-purpose canister design

• Ensuring adequate repository capacity
Multiple Hypotheses for Thermal Effects

• Bounding cases
  – high loading with possibility for extended dryout
  – low loading with potential for limited thermal disturbance

• Goal: maintain design flexibility to increase thermal loading to improve postclosure performance and cost-effectiveness, if supported by test results
Supporting Critical Milestones

• 1998 Technical Site Suitability
  – Use best available site and engineering data to evaluate suitability over the range of thermal loadings under consideration

• 2001 License Application
  – Evaluate performance for range of loads that can be supported with available site and engineering data
  – Maintain design flexibility to operate within the range of thermal loadings
Testing to Evaluate Thermal Effects

• Earlier *in situ* testing options are being considered
  – early access to potential repository horizon (TSw₂) for thermal testing

• Understanding uncertainties in performance predictions over the range of thermal loadings is the key
Balancing Repository Objectives: (Example)

- Complexity of performance modeling reduced, if coupled processes are less important
- Waste package performance may improve, if dry near-field environment can be assumed
- Cost is lower, if less repository area is utilized
- Preclosure operations may favor lower thermal loadings
- Less thermal disturbance may increase distance for calculating groundwater travel time
Multi-Purpose Canister Implementation

• Multi-purpose canister as a canisterized waste form is an important consideration in evaluation of thermal loading

• Conceptual design and specifications for multi-purpose canister considered repository thermal constraints (e.g. rock wall temperature, cladding temperature)

• Goal: balance program needs against impacts of early multi-purpose canister design decisions
Repository Capacity

• Lower end of thermal loading range is likely to require larger repository area

• Contingency plans for limited characterization of potential expansion areas are under consideration

• Other design options may also exist
Activities Underway Related to Thermal Loading

• Developing a coherent thermal loading strategy

• M&O Draft White Paper on Thermal Loading
  – Currently under review
  – Defines key technical issues to be considered
  – Attempted to establish an integrated approach to evaluating options
  – Identifies key information needs

• Evaluating and prioritizing the \textit{in situ} tests that will advance the understanding of thermal effects

• Developing flexible design plans for repository and waste package