MINED GEOLOGIC DISPOSAL SYSTEM (MGDS) THERMAL-LOADING SYSTEMS STUDY

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Outline

• Thermal-loading systems process
• System study objectives
• Thermal-loading activities status
• System study approach
• Summary
Thermal-Loading Systems Process

Functional Analysis
- System Requirements
- Regulations and Laws

Performance Assessment
- Requirement Allocation
- Analytic Code Development

Systems Engineering
- Systems Studies

Site Suitability
- License Application
- Performance Confirmation Data

Analysis and Testing
- Site Investigation Activities
- Design Activities

Data Requirements
- Develop Plans (SCP; Design)

THRMLOAD18.122.7/13-14/93
Objectives of the FY93 Thermal-Loading Study

The MGDS Thermal-Loading Study uses a systems approach to achieve the following objectives:

- Integrate activities pertaining to the thermal loading decision
- Focus thermal loading and determine what is “too hot”
- Provide recommendations as to a range or ranges of thermal loading that as is currently believed, would be licensable
- Identify work needed to resolve uncertainties
  - Analysis or analytic code development
  - Testing
Status of Efforts

- MGDS Thermal-Loading Study approved, funded by YMP and initiated by M&O
  - A systems analysis approach which utilizes full range of M&O capabilities
  - Involves participation by national laboratories and others

- Other supporting studies underway
  - System-wide studies (architecture, MPC, ...) 
  - Total Systems Performance Assessment (TSPA)

- Analytic code assessment underway
  - Identifying important aspects of the problem
  - Benchmarking
Status of Efforts (Continued)

• Phase I Thermal-Loading Systems Study completed
  - CRWMS can accommodate a wide range of thermal loading from the standpoint of waste streams and acceptance rates

• Testing programs initiated
  - Laboratory testing including drill-core analysis ongoing
  - Heated block tests funded and planning started
  - ESF heater test planning started

• Thermal goals being re-evaluated
  - YMPO sponsored assessment
  - Preliminary draft report completed May 31, 1993
FY93 Study Approach

- Evaluate pre-closure performance such as safety, operability, and cost
- Evaluate post-closure performance
- Identify and/or address important uncertainties associated with waste isolation
- Address uncertainties in performance standards
- Incorporate input from the national laboratories
- Narrow the range of thermal loading options
- Provide recommendations
FY93 MGDS Thermal-Loading Study

Phase I Thermal Loading

Throughput Study

FY93 MGDS Technical Document Preparation Plan

Develop Requirements/Inputs

Thermal Performance Objectives

Assess Thermal Effects

Evaluate Performance

Additional Thermal Needs

Recommend and Document

System-Wide Issues

Testing & Analysis Efforts

MGDS System Studies

May June July Aug Sept Oct Nov Dec Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec

FY92 FY93 FY94
Develop Requirements/Inputs

Waste Package (WP)/Multipurpose Container (MPC) Inputs

- Capacity
- Thickness
- 3/8"
- 12"
- WP Concept

Radiation Dose Calculations

- Capacity
- High Dose
- Extensive Shielding
- Low Dose
- Moderate Dose
- Shielding or Borehole Required

Subsurface/Surface Operability

- Inputs Developed
- Repository Design Options
- SCP
- Thermal Goals
- Re-evaluation
- Site Rock Parameters etc.

Considered - Weight Limits - Size Limits

THRMLOAD8.122 7/13 14/93
Establish Upper Thermal Bounds

Evaluation of thermal load
- Near-field effects
- Various emplacements
- Waste stream

Perform rock mechanics calculations
- Some estimates for vertical borehole used for existing criteria
- Calculations for drift wall needed
- Ventilation effects

Subsurface operability evaluated
- Considerations - ventilation, safety and retrievability
- Output
  - Regimes for wheeled emplacement
  - Regimes for tracked vehicles
Examine Thermal Effects

Perform parametric thermal calculations for all selected waste packages and thermal loadings

- 3D large area thermal calculations
- Emplaced in vertical or horizontal borehole
- Emplaced in-drift
- Hydrologic changes

Geochemical evaluation
- Assess changes due to temperature increases
- Evaluate affects of changes in liquid saturation
- Water chemistry changes

Evaluate performance against thermal goals
- Utilize goals established by expert assessment group
- Examples of possible goals
  -- Centerline WP temperature
  -- 1m rock temperature
  -- TSW3/2 temperature
Additional Thermal Needs

- Perform sensitivity analyses to evaluate options and to identify risks

- Assess additional needs
  - Test data required to reduce uncertainties
  - Additional analysis
  - Integrate with testing

- Identify system-wide issues
Summary

What do we expect the study will accomplish?

- Provide input to integrate activities supporting thermal loading decision process
- Establish thermal bounds as to what may be “too hot”
- Recommend a range or ranges of thermal loading that, as is currently believed, would be licensable
- Identify uncertainties that are affected by thermal loading and that could impact waste isolation
- Reassess thermal goals
- Identify system wide impacts of thermal loading
Summary
(Continued)

Where do we go from here?

- Coordinate with testing activities to ensure that desired data with adequate accuracy is being collected
- Develop approaches to reduce uncertainties
- Update analysis (TSPA, operations, cost) as improved data and models become available
- Continue providing analysis framework for Thermal Loading Decision and assure that the decision is updated as data becomes available