SUBJECT: FOCUSED MGDS - ACD STATUS AND UPDATE ON THERMAL LOADING SYSTEMS STUDY

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RENO, NEVADA APRIL 11-12, 1994
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Is Yucca Mountain A Suitable Site for a Repository?

Repository/Waste Package Role:

- Assure site investigation, design and construction activities are compatible with a potential repository design
- Develop repository and waste package designs in order to identify impacts to existing conditions
- Provide basis for safety and waste isolation evaluations
The Mined Geologic Disposal System (MGDS)
MGDS Design Organization

M&O is the responsible MGDS Design Organization
- TRW
- Fluor Daniel
- Morrison Knudsen
- B&W Fuel Company

Lawrence Livermore and Sandia National Laboratories are primary participants for scientific basis for design (substantiating assumptions)
Design Phases

TYPICAL DOE DESIGN PHASES

Title I
Conceptual Design
(Preliminary)

Title II
Design
(Final)

Title III
Design
(As Built)

OCRWM DESIGN PHASES

SCP Conceptual Design
Advanced Conceptual Design (ACD)
License Application Design (LAD)
Final Procurement and Construction Design (FPCD)
(As Built)

Suitability Determination
License Application (If Suitable)

TPRWP6.122/2-11-94
Current Design Schedule

1987 Dec.
SCP Conceptual Design

Pre-ACD Studies

Advanced Conceptual Design

Final SCP Conceptual Design

Start ACD Activities (Limited Basis)

MPC Baseline Change/Focused ACD Plans
The Program Technical Baseline Changed in February 1994 with the Multi-Purpose Canister (MPC) Decision

Canister and overpacks must meet NRC regulations

- Storage, 10 CFR 72
- Transportation, 10 CFR 71
- Disposal, compatible with 10 CFR 60
Design Evolution

• The MPC decision and technical baseline changes require the current SCP-CD to be replaced.

• The Project Design Team is now developing a Focused Advanced Conceptual Design (ACD) to replace the SCP-CD. The ACD will support
  - Site suitability interim evaluations
  - Total System Life Cycle Costs (TSLCC)
  - Environmental Impact Statement (EIS) Development
  - License Application Development
Design Assumption Process

Identify List of Design Assumptions

- Review Sources
  - Tech Data Base
  - RIB
  - Studies Digest
  - Design handbooks
  - Other

Identify Key Assumptions?

- Yes
  - M&O Develop Assumption

- No
  - Form Specialist Panel
    - Panel Develop Assumption
    - Complete Assumption Rationale Sheet
    - Control in CDA

Criteria

Criteria
Controlled Design Assumption Document

Outline

I. Introduction

II. Requirements
   A. EBDR
   B. RDR

III. Concepts
   A. Concept of Operations
   B. Design Concepts
      1. Waste Package
      2. Repository
         a. Surface
         b. Subsurface

IV. Technical Data

Appendix A. Rationale for Assumptions

Appendix B. Substantiation Tracking Sheets

Appendix C. Traceability Matrices
# Focused ACD Schedule

<table>
<thead>
<tr>
<th>KEY ACTIVITY</th>
<th>FY 1994</th>
<th>FY 1995</th>
<th>FY 1996</th>
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<tr>
<td><strong>DESIGN:</strong></td>
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<tr>
<td>MPC</td>
<td>▼ Baseline ▼ RFP</td>
<td>▼ Award contracts</td>
<td>▼ Submit applications to NRC</td>
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<td>CDA</td>
<td>▼ Draft ▼ Rev.0</td>
<td>▼ Rev.1</td>
<td>▼ Rev.2</td>
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<td>ACD Summary Report</td>
<td>▼ Initial</td>
<td>▼ Interim</td>
<td>▼ Final</td>
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<td>Substantiation of Assumptions</td>
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<td>▼ Status Review</td>
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<tr>
<td><strong>ELEMENTS REQUIRING DESIGN SUPPORT:</strong></td>
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<tr>
<td>Interim Site Suitability Report</td>
<td>▼ Rev.3</td>
<td>▼ Rev.4</td>
<td>▼ Rev.5</td>
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<tr>
<td>License Application Annotated Outline</td>
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<tr>
<td>Site Characterization Progress Reports</td>
<td>▼ #9 ▼ #10</td>
<td>▼ #11 ▼ #12</td>
<td>▼ #13 ▼ #14</td>
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<tr>
<td>Input to Total System Life Cycle Cost</td>
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</table>
Waste Package Design
21 PWR Multi-Purpose Canister

Outer Containment Barrier

Inner Containment Barrier

Sealed 21 PWR MPC

Outer Diameter 179 cm
Overall Length 559 cm
Waste Package Design
12 PWR Multi-Purpose Canister

Outer Containment Barrier

Inner Containment Barrier

Sealed 12 PWR MPC

Outer Diameter 152 cm
Overall Length 557 cm
Waste Package Design
Defense High Level Waste

Outer Containment Barrier

Inner Containment Barrier

Bottom Spacer

4 DHLW Containers

Top Spacer
Internal Lid

Outer Lid

Outer Diameter 179 cm
Overall Length 370 cm
Waste Package Design
Uncanistered Spent Fuel

Inner Containment Barrier
Fuel Assemblies
Spent Nuclear Fuel Basket
Outer Containment Barrier

Outer Diameter 175 cm
Overall Length 529 cm
## Waste Package Design
### Conceptual Materials

<table>
<thead>
<tr>
<th>Design Option</th>
<th>Inner Containment Barrier</th>
<th>Outer Containment Barrier</th>
<th>Loaded Weight</th>
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<tr>
<td></td>
<td>Material</td>
<td>Thickness</td>
<td>Material</td>
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<tr>
<td>21 PWR MPC</td>
<td>Alloy 825</td>
<td>2 cm</td>
<td>A 516 Carbon Steel</td>
</tr>
<tr>
<td>12 PWR MPC</td>
<td>Alloy 825</td>
<td>2 cm</td>
<td>A 516 Carbon Steel</td>
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<tr>
<td>4 DHLW</td>
<td>Alloy 825</td>
<td>2 cm</td>
<td>70-30 Cupronickel</td>
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<tr>
<td>21 UCF WP</td>
<td>Alloy 825</td>
<td>2 cm</td>
<td>A 516 Carbon Steel</td>
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REPOSITORY SUBSURFACE FACILITIES

ADVANCED CONCEPTUAL DESIGN STATUS

Have developed a new "Working Concept" that:

- Facilitates disposal of MPC based waste packages
- Utilizes safer, flatter slopes and an integrated, surface/underground rail transport system
- Avoids major faults
- Is based on up-dated geological information
Repository Layout - SCP Concept

North Portal

Main Test Area

South Portal

Emplacement Tunnels or "Drifts"

SCP Repository Perimeter

Imbricate Fault Zone

Sundance Fault

Ghost Dance Fault

Drill Hole Wash Structure

Solitario Canyon Fault
Working Concept Repository Layout (For Lower Thermal Loading)

- North Portal
- South Portal
- Main Test Area
- Lower Emplacement Block
- Emplacement Tunnels
- Drill Hole Wash Structure
- Imbricate Fault Zone
- Sundance Fault
- Ghost Dance Fault
- Emplacement Exhaust Shaft
- Access Ramp to Lower Block
- Development Ramp
- Development Intake Shaft
- Solitario Canyon Fault
LEGEND

- Areas utilized only by SCP layout
- Areas utilized only by Working Concept layout
- Areas common to both SCP and Working Concept layouts
Section A - A'

Note: Plane of section cuts through lowest emplacement drift in working concept layout.
An In-drift Emplacement Concept for MPC Based Waste Packages

- Emplacement Drift
- MPC Waste Package (21 PWR)
- Emplacement Cart

4.3 M (14 FT.)
Enlarged Plan in Service/Launch Mains Area - Development Operations

- SERVICE PLATFORM
- SERVICE MAIN
- RAMP SECTION
- CROSSCUTS
- RADIATION DOOR CUTOUTS
- TBM LAUNCH MAIN
- EMISSALMENT TUNNELS
Offloading MPC Based Waste Package Into End of Emplacement Tunnel
Empty Cask Rotated for Return Trip to Surface

- Empty Underground Transport Cask
- Emplacement Platform Turntable
- WASTE HANDLING MAIN DRIFT
- WASTE PACKAGE "PARKED" IN EMBLACEMENT TUNNEL
- Radiation Door
Underground Locomotive Moving Waste Package to Emplacement Location

- **Locomotive** (Operated Remotely)
- **MPC Based Waste Package**
- **Previously Emplaced MPC Waste Packages**
- **Emplacement Tunnel**