SUBJECT: REPOSITORY OPERATIONAL CONCEPTS

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Overview

• Repository operational concepts for the following phases:
  – Construction
  – Waste package emplacement
  – Waste package retrieval
  – Closure

• Within the above context address
  – Alternatives considered
  – Specific design issues
Repository Design Schedule

According to OCWRM Program Plan

• Complete conceptual design by March 1997
• Complete License Application design by September 2000
• Presently less than halfway through conceptual design
Phases of Mined Geological Disposal System (MGDS) Operations

The MGDS is developed and operated in the following phases

1. Site characterization
2. Construction *
3. Development*
4. Emplacement*
5. Caretaker
6. Retrieval*
7. Closure*
8. Off-normal
9. Performance confirmation
10. Postclosure
Repository Construction Phase

- Begins after construction authorization (FY 2004)

- Ends when surface facilities and sufficient underground construction have been completed to permit steady emplacement that may be concurrent with the development phase (FY 2010)
At the end of the construction period the following surface facilities will have been constructed:

- Site preparation system
- Site transportation systems
- Site utilities systems
- Waste handling facilities
- Operational support facilities
- General support facilities
- Offsite utilities
- Offsite transportation
PROPOSED REPOSITORY SURFACE FACILITIES

- NORTH PORTAL
- EXISTING ESF TYPICAL
- WASTE HANDLING OPERATIONS
- CASK MAINTENANCE OPERATIONS
- WASTE TREATMENT OPERATIONS
- BALANCE OF PLANT AREA
- CARRIER STAGING SHED

WASTE OPERATIONS GARAGE
Repository Construction Phase
(Continued)

• Subsurface construction will begin in the upper emplacement block and will include
  – System of main drifts
  – Shafts
  – Interconnections from mains to shafts
  – Supporting openings
  – Emplacement drifts (10 to 25) starting at the north and proceeding south
  – Separate ventilation system
  – Physical separation of development and emplacement operations
Repository Construction Phase

(Continued)

At the end of the construction period the following subsurface facilities will have been completely or partially constructed:

- Excavated openings
- Support facilities
- Utilities system
- Ventilation system
- Shielding equipment/systems
- Waste package handling system
- Operational support system
- Performance confirmation system
- Construction equipment and temporary facilities
Repository Development Phase

- Repository development is a continuation of the construction phase
- Continues from the time when steady emplacement begins (FY 2010) through end of emplacement (FY 2034)
- Proceeds concurrently with waste package emplacement
Repository Development Phase  
(Continued)

- Development continues with excavation of a number of drifts (e.g. 10 to 25) at a time
- These drifts are provided with ventilation, transportation, ground support, etc.
- Substantial stoppings are built to physically separate them from future development activity
- A set of these drifts are turned over to the emplacement operation
Conceptual Layout Showing Concurrent Development and Emplacement Phases
Some of the issues related to repository development are:

- Flexibility
- Thermal loading
- Extent of areas needed
- Emplacement strategy
- Rate of emplacement
- Spacing of waste packages and drifts
- Interface between development and emplacement
- Limitations of excavation equipment used
IS NORTH RAMP
MAIN TEST AREA
POTENTIAL WASTE TRANSPORT CONNECTOR DRIFT
EMPLACEMENT EXHAUST SHAFT
POTENTIAL DEVELOPMENT RAMP ACCESS TO LOWER BLOCK
NORTH NORTH RAMP EXTENSION
MAIN TEST AREA
IS NORTH RAMP
TS: IMBRICATE DRIFT
POTENTIAL PERIMETER VENTILATION MAIN DRIFT
DEVELOPMENT EXHAUST SHAFT
SOUTH PORTAL
TS SOUTH RAMP
SOUTH RAMP EXTENSION
POTENTIAL DEVELOPMENT RAMP ACCESS TO LOWER BLOCK
NORTH PORTAL
TS NORTH RAMP
MAIN TEST AREA
POTENTIAL WASTE TRANSPORT CONNECTOR DRIFT
EMPLACEMENT EXHAUST SHAFT
POTENTIAL DEVELOPMENT RAMP ACCESS TO LOWER BLOCK
NORTH RAMP EXTENSION
TBM LAUNCH MAIN/WASTE HANDLING MAIN
PERIMETER VENTILATION MAIN DRIFT
DRIFTS ON 22.5 m² MAX POSSIBLE AML = 100 MTU/AC
2020 DEV 9 YR END
DRIFTS ON 45.0 m² MAX POSSIBLE AML = 50 MTU/AC
2020 DEV 9 YR END
DRIFTS ON 45.0 m² MAX POSSIBLE AML = 100 MTU/AC
2020 DEV 9 YR END
INTERIM ESF/REPOSITORY CONCEPTUAL LAYOUT: OPTION 1
WITHOUT CALCO HILLS DRIFTING
ORIGINAL: K. CHRIST; DESIGNED: D ML
REVISED: 11-10-94
Repository Emplacement Phase

- Begins when first shipment of waste is received
- Ends when the last shipment is emplaced
- Development and emplacement are concurrent
Repository Emplacement Phase
(Continued)

Transfer of waste package from surface facilities to underground

- At the waste handling building
  - Load waste package into transport cask
  - Attach waste package prime mover to the transport cask
  - Move transport cask out of the building
  - Transport to a ramp portal
  - Transport through waste handling main drift to the designated emplacement drift
WASTE HANDLING BUILDING
MULTI-PURPOSE CANISTER OPERATIONS

1. CARRIER BAY
2. AIRLOCK
3. LOADED CASK PREPARATION
4. RAIL CASK DECON
5. RAIL CASK PORT ROOM
6. AIRLOCK
7. SPENT FUEL ASSEMBLY CASK DECON
8. RAIL CASK TRANSFER ROOM
9. DISPOSAL CONTAINER WELDING
10. DISPOSAL CONTAINER HORIZONTALIZING
11. DISPOSAL CONTAINER DECON
12. UNDERGROUND TRANSFER
Transfer of waste package from surface facilities to underground (continued)

Alternatives under consideration include:

- Waste package transport cask/carrier
- Transport mechanism to underground
  - Wheeled and tracked vehicles
  - Monorail system
  - Integrated rail system
TRANSPORT CASK WITH TRANSFER WHEELS ON RAIL CARRIER

TRANSPORT CASK WITH TRAVEL WHEELS
Repository Emplacement Phase

(Continued)

Handle waste package at designated emplacement drift entrance

Operations will include

• Position transport cask
• Open shielding components
• Off-load waste package from transport cask
• Remove transport cask
• Position emplacement equipment
• Off-load emplacement equipment
• Close shielding components
Waste Package Handling at Designated Emplacement Drift Entrance

- TBM Launch Main Drift 9.0 m Dia.
- Shielding Radiation Door
- Crosscut
- Electric Powered Locomotive
- Waste Package and Emplacement Cart
- Temporary Rail Support
- Graphic Scale

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Waste Package Handling at Designated Emplacement Drift Entrance

- **Waste Package and Emplacement Cart**
- **Radiation Door**
- **TBM Launch Main Drift 9.0 m Dia.**
- **Crosscut**
- **Temporary Rail Support**
- **Graphic Scale**

Dimensions:
- **Emplacement Drift**: 17.0 m
- **6.1 m**
- **5.0 m**
- **3.6 m**
- **2.5 m**

**Electric Powered Temporary Transport Cask**

**EWR**
Repository Emplacement Phase

(Continued)

Handle waste package at designated emplacement drift entrance (continued)

Alternatives under consideration include

• Turntable versus direct transfer
• Air bearing/pallet
• Rail cart
• Roller conveyor
Repository Emplacement Phase
(Continued)

Emplace waste package in drift

• Operation will include
  - Transport waste package through emplacement drift
  - Emplace waste package
  - Return emplacement equipment to drift entrance

• Alternatives under consideration:
  - Emplacement equipment-emplacement drift locomotive/gantry
  - Waste package base-rail cart/pedestal
Waste Package Retrieval Phase

- Includes all actions required to retrieve waste, if required

- Retrieval may be necessary or required at any time during or after emplacement

- Retrieval option to be maintained for up to 100 years after initiation of emplacement (2110)
Waste Package Retrieval Phase
(Continued)

Retrieval operation will include the following:

• Provide access to the emplacement drift
• Remove waste package from emplacement drift
• Transfer waste package to surface handling facilities
• Further handle and process retrieved waste

Note: Issues and alternatives are discussed in a separate presentation on retrievability
Repository Closure Phase

Begins when NRC amends the license to authorize permanent closure
Includes backfilling and sealing
Decontamination and dismantling of facilities
Protective system established
Repository Closure Phase
(Continued)

Closure will include the following operations:

- Decontaminate and remove underground equipment and fixtures
- Prepare emplacement drifts to receive backfill (if required)
- Backfill the drifts (if required)
- Emplace repository seals
- Establish protective systems
Issues related to closure include the following:

• Performance requirement of backfill
• Type of backfill
• Construction of backfill to meet a given specification
Summary

• Discussed the construction, development, emplacement, retrieval, and closure phases
• Provided examples of alternate concepts for each phase
• Discussed some of the issues related to the various phases of repository operations