

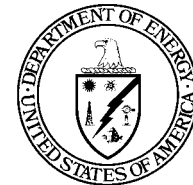
YUCCA MOUNTAIN PROJECT

Studies

Subsurface Remote Operations

Presented to:
Nuclear Waste Technical Review Board

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Office of Civilian Radioactive
Waste Management

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Subsurface Remote Operations

Need for Remotely Operated Systems:

- High Radiation:
Unshielded WP ~40 rem/hr
- Elevated Temperatures:
Emplacement: 50 °C
Post-Emplacement: 200 °C
- Large/Heavy Payloads
- Access Limitations/Confined Operating Areas

Assumptions:

- Key CDA # 013: Under normal conditions, no human entry is planned in the emplacement drifts while WPs are present
- Key CDA #016: Repository designed for retrievability
- Key CDA # 061: Performance Confirmation to provide remote inspection capability
- Key CDA #066: Emplacement on pedestals by mobile gantry
- Repository Reference Design: Operational concepts rely on successful implementation of remote systems

Subsurface Remote Operations

Highlights from recent surveys of available remote systems technology:

- **Mining**: Remotely controlled locomotives, load-haul-dump vehicles, subsurface control and communication systems, automated mining & haulage systems
- **Rail-Transit**: Remotely controlled driverless trains, automated people movers, automated rail switching and train monitoring systems, mobile communication and power systems
- **Nuclear**: Plant monitoring, control, and instrumentation; radiation tolerant electronic components and systems, control and communication systems, teleoperation and telerobotics, Remotely-Operated-Vehicles (ROVs)

Subsurface Remote Operations

- **Manufacturing:** Industrial automation, controls, actuators, sensors and robotics; Programmable-Logic-Controllers (PLCs), Automatically-Guided-Vehicles (AGVs), automated warehouses
- **Construction:** Remotely controlled tower and gantry cranes, remotely operated loaders, haul trucks, and demolition equipment
- **Aerospace:** Advanced telemetry and telecommunication systems, telerobotics, operator interfaces, command & control systems, fly-by-wire control systems, remote sensing systems, thermal control systems and high-temperature materials
- **Institutional research:** DOE, DOD, NASA, and University programs

Subsurface Repository Control Systems Figure

Multi-vision Figure

Photo

Skytrain

The Ursula Manipulator