"Overview of the Current CRWMS Repository Design"

## Introduction

This paper presents a summary of the current design for a potential geologic repository. The objective of the paper is to present the key design features of the MGDS surface facilities and MGDS subsurface facilities.

## Surface Layout

The surface layout consists of four major areas: the north portal area includes the facilities to receive and package the waste for emplacement and the site support facilities; the south portal area which will support excavation of the underground; the emplacement shaft area which includes the emplacement ventilation exhaust fans and maintenance facilities; and a development shaft area which will house the development intake fans and emergency hoisting system.

The north portal area will contain a radiologically controlled area and an area for the balance of plant facilities. The three primary facilities in the radiologically controlled area are the waste handling building, the waste treatment building and the carrier preparation building. The design of the waste handling building is described below. The waste treatment building is designed to treat and package low level waste for off-site disposal. The carrier preparation building is designed to prepare and remove the shipping casks from the rail or truck carriers.

## Waste Handling Operations Design

The waste handling and support areas of the waste handling building include the following:

- Transportation cask unloading/loading bay for truck and rail carriers;

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- three assembly transfer lines, each with pools for unloading and staging individual fuel assemblies and three hot cells for conducting other assembly transfer operations;
- two canister transfer lines, each with a cask preparation area and one hot cell for conducting the canister transfer system operations;
- one disposal container welding hot cell;
- one small hot cell for placing loaded waste packages onto underground transporters; and
- one general purpose hot cell for mitigating an off-normal disposal container.

The waste handling building will utilize both 125-ton and 85-ton bridge cranes in the unloading bay, the assembly transfer lines, the canister transfer lines, and the disposal container handling area. In addition, the assembly transfer lines, the canister transfer lines and the disposal container handling area will include in-process staging areas. The assembly transfer lines include an assembly transfer machine, vacuum drying vessels and a dry-fuel-handling machine to transfer the assemblies from the pool to the disposal containers. The canister transfer lines include the hot cells and equipment required to transfer the disposable canisters into a disposal container. The disposal container handling area will contain the systems required to seal and prepare the waste packages for transport underground. The system will also include the systems required to load the waste package on the transporter's rail car.

**Subsurface Design**

The waste will be placed in underground horizontal emplacement drifts located in the emplacement block in the Topopah Spring tuff. The distance between the drifts and the spacing of the waste packages within the drifts provides an areal mass loading of about 85 MTU per acre. The emplacement drifts will be 5.5 meters in diameter and be between 500 meters and 1200

meters in length. The emplacement drifts will be spaced 28 meters apart and the ventilation raises will be located near the center of the drift, connecting the emplacement drifts with the underlying exhaust main. The waste emplacement block will be located at least 200 meters below the surface and at least 100 meters above the water table. The block will cover 300 hectares (740 acres) and will accommodate about 10,200 waste packages. The emplacement drifts will run in approximately an east-west direction and will involve about 117 kilometers of drifts.

The subsurface facility will contain two types of main drifts. The service main drifts will be 7.6 meters in diameter and will include the ramps with a maximum grade of 2.7%. The exhaust main drift for ventilation will be 7.6 meters in diameter and will be located 10 meters below the emplacement drift. The total length of drifting, including the already constructed Exploratory Studies Facility, mains and emplacement drifts, is approximately 157 kilometers.

**Underground Transport and Emplacement Design**

The loaded underground transporter will be moved underground by two transport locomotives. The locomotives will be electrically powered and will have controls for both manual and remote operations. The transporter will include radiation shielding and an integrated remotely controlled loading/unloading mechanism to accept and deploy the waste packages on a transfer rail car. Once transported underground, the waste package will be emplaced in the emplacement drift utilizing a gantry system. The electrically powered emplacement gantry will be rail mounted and remotely controlled.

## Conclusion

This paper presents the reference design for the potential repository as developed for the Viability Assessment of the MGDS. The paper presents the key reference design features associated with the surface and subsurface facility layouts as well as the design to support the waste handling and emplacement operations. A more detailed presentation is provided in the "Reference Design Description for a Geologic Repository" which is located on the YMP Homepage at www.ymp.gov.

Table 1.

Spent Nuclear Fuel and High-Level Waste

to be Accepted at the Repository

| Type | Amount (MTU) |
|---|---|
| Commercial SNF | 63,000 |
| Commercial HLW | 640 |
| Defense HLW | 4,027 |
| DOE SNF | 2,333 |
| Total | 70,000 |