TRANSPORTATION OF SOLID IRRADIATED AND CONTAMINATED NON-FUEL RADIOACTIVE MATERIAL IN LARGE TRANSPORTATION PACKAGE

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ABSTRACT

Currently in the United States of America non-fuel bearing solid irradiated material generated during the operation of nuclear power plants is transported offsite in smaller transportation packages depending on the availability of the disposal sites. In the meantime, these materials are stored at the reactor sites generally in spent fuel pools posing challenges for spent fuel pool space and capacity management at some of the utilities. Examples of irradiated and contaminated hardware include: Control Rod Blades, Local Power Range Monitors, Fuel Channels and Poison Curtains for BWRs and Burnable Poison Rods Assemblies for PWRs. Decommissioned plants also have a need to dispose of segmented reactor vessel and internals. There is a need for disposal of these materials using a suitable larger transportation package.

Transnuclear Inc. belonging to Logistics Business Unit of AREVA has designed a Radioactive Waste Container (RWC) that can be used to package these materials on site. The RWC can then be transported offsite in the MP197HB Transportation Package as a payload to a disposal facility. Some spent fuel pools are limited in available space for storage of RWC. In such cases, RWC is designed to be transferred from the spent fuel pool to a temporary onsite storage facility. The unique designs of RWC and MP197HB Transportation Packages allow onsite storage of a partial or a fully loaded RWC at the plant site either in a spent fuel pool or in a temporary onsite over pack before transportation. The design features of the RWC allow for repeated intermittent loadings of these materials for better packaging efficiency, higher packaging density for radiation dose, cost and space savings to the user.

This paper examines some of the unique design features of RWC and MP197HB Transportation Package that allow user to realize the benefits of using larger package for transportation and disposal.

INTRODUCTION

In the United States of America (USA) irradiated hardware waste is classified in accordance with the level of activation/dose as Class A, B, C or Greater Than Class C (GTCC). Until recently, Class A, Class B and Class C waste was transported directly from the utility generation site to disposal facilities. However, there have been recent changes in waste disposal facility availability in the USA. Currently, in the US there is adequate disposal opportunity for waste classified as A and limited disposal opportunities are available for waste classified as B and C. GTCC waste is restricted to the utility generation site and is typically stored in the spent fuel pool or at an Independent Spent Fuel Storage Installation (ISFSI) at the utility site.

The most practical and economical solution for GTCC is to use a system that is consistent with the ISFSI current configuration compliant with the 10CFR Part 72 regulations. Prime examples of this type of storage are the GTCC stored in the NUHOMS® compatible canisters at the San Onofre ISFSI in California and the GTCC stored at the Rancho Seco ISFSI also in California.

Figure 1. ISFSI’s With GTCC Storage

One additional example of GTCC storage is that at the Millstone Unit 1 power plant. This GTCC is stored in the Unit 1 spent fuel pool and was packaged in smaller cans which are compatible for insertion into a NUHOMS® canister for eventual placement on Millstone ISFSI or transport to disposal facility.

The GTCC canisters have a volume of approximately 300 cubic feet to 400 cubic feet and can be loaded to weight limits in the range of 50,000 pounds to 60,000 pounds. The use of the larger canister provides for more efficient storage and a smaller number of Public road/rail Transport campaigns when a disposal sites become available.

CLASS B AND CLASS C IRRADIATED HARDWARE WASTE

The standard approach for transport and disposal for Class B and Class C waste has been to use a "legal weight" transportation cask able to meet current over Public road requirements and licensed to 10 CFR Part 71 requirements. This transportation cask is loaded at the utility generation site and then transported to a licensed disposal facility. An example of one such cask is the Transnuclear TN-RAM transportation package. The TN®RAM is one of the most actively used casks currently transporting Class B and Class C waste in the USA.

Figure 2. TN®RAM in Operation

Due to the "legal weight" limit and the amount of shielding required for the higher source material, the payloads for these Class B and Class C casks are generally limited to approximately 10,000 pounds with a waste volume less than 50 cubic feet to 100 cubic feet. The efficiency for loading each package is usually considerably less than the package limits.

It is prudent to remove the waste from site as quickly as practical as long as a disposal site is available to accept the waste. However, if no disposal site is available for the waste it becomes inefficient to store the waste in the smaller packages. Small package storage could, depending on the total waste to be removed, potentially require more Public road/rail transports in the future than would be needed with large package storage.

THE LARGE PACKAGE SOLUTION

Transnuclear, Inc. has used the experience it has gained in providing packaging for used fuel and GTCC waste to develop a large multipurpose package that can accommodate all Classes of waste for both onsite storage and then transport. The storage solution is in the form a patented approach that consists of a large variable partitioned container that is compatible with the NUHOMS® transfer and transport systems which can be loaded with irradiated reactor components (hardware such as control blades, fuel channels, etc) and waste including GTCC.

Figure 3. NUHOWS Rad Waste Container

The bolted closure version of the storage container can be easily re-opened to allow for partial loading, insertion into storage overpack and then retrieval, additional loading and re-insertion into storage overpack until the container is fully loaded and/or a disposal site is available.

Figure 4. NUHOWS RWC Inserted into HSM

The advantages of this large package approach are that it provides better packaging efficiency, higher packaging density, space savings and ultimately over the life of the package reduced costs. The fact that the larger package is compatible with the licensed NUHOMS® system for storage and transport of fuel assures that the operations are well defined and compatible with almost any reactor site and that the waste is ready for transport when a disposal site is available.

In the USA, BPRAs can be stored with fuel assemblies when they are stored at the ISFSI in a dry storage system. In some other countries, BPRAs are stored independently in a separate container. The RWC is perfectly suited for such application. The design of the RWC is flexible and the internal storage cavity can be adopted to various shapes and sizes depending on the user needs. With the use of bolted lid, partial filling and intermediate storage on site at the waste generation site and then refilling the remaining empty volume within the RWC as additional waste is generated leads to a very cost and dose efficient system. The RWC cavity is sufficiently large to avoid underwater cutting of control rod blades, avoid any compaction or volume reduction needs.

Transnuclear, Inc. is in the final stage of licensing the transportation of this canister in the MP197HB Transport cask for use in the USA under the rules of 10CFR Part 71. The final approval from the US NRC is expected later this year (2010).

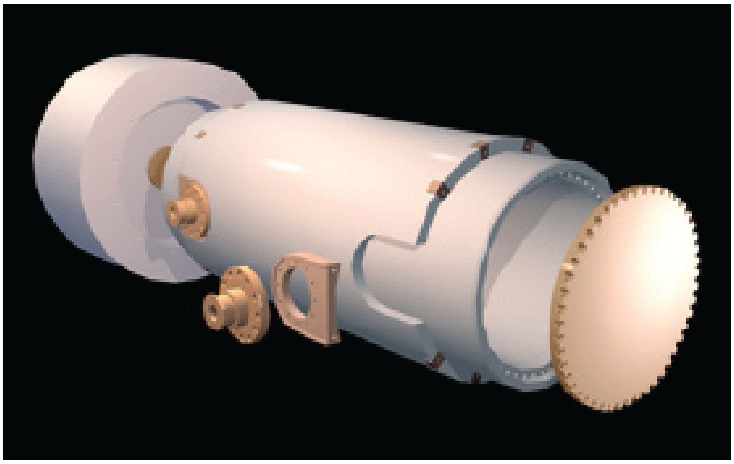

Figure 5. NUHOMS® MP197HB

CONCLUSION

The large package is able to store and transport from 6 to 7 times, by weight and volume, the amount of waste currently transported by a smaller cask. Additionally, the size of the canister allows selected hardware to be stored and transported without the need for segmentation or crushing.

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