TRANSPORTATION PACKAGE FOR USE IN FACILITIES WITH LIMITED CRANE CAPACITY

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ABSTRACT

Transnuclear, Inc. is a U.S. based company belonging to the Logistic Business Unit of AREVA is a well known leader in spent fuel transportation and storage cask design and manufacturing. Transnuclear, Inc. has designed and licensed numerous spent fuel storage and transportation cask models. However, as of today, commercial spent fuel assemblies are stored onsite due to the lack of either a central repository or reprocessing facility. Consequently, the market shipping needs are very specifics. They include research reactor fuel shipments, irradiated material shipments in connection with facility decommissioning, and irradiated fuel pins for post-irradiation examination. Those shipments require smaller transportation packages compared to those of commercial reactor. Additionally, interfacing with loading and unloading facilities designs, nuclear power plant fuel pools, shallow research reactor pools, hot cell facilities, etc. Limited crane capacity is also constraint.

Majority of these types of transport packages have licenses from regulatory authorities outside of the USA which cannot be used for domestic shipments. Therefore, to address customer needs for domestic shipments, Transnuclear, Inc. has developed a 25 tons weight cask design. This design improves the capacity of the casks currently licensed while keeping the total weight of the package (including its impact limiters) low enough so that it can be used by most research facilities and hot cells. This new cask design is able to handle PWR, BWR, MOX, EPR, TRIGA and various research reactor fuel assembly designs as well as non fissile irradiated contents. This new cask features openings at the top and at the bottom, will be able lo be loaded and unloaded horizontally and vertically in a hot cell or in a fuel pool, and to be loaded and unloaded upside down depending upon the facility interface requirements. Transnuclear, Inc. has worked with the Logistic Business Unit of AREVA in France to ensure that this cask design is also compatible with European facilities. The safety analysis report is under preparation and will be submitted to the US NRC for their review and approval later in 2010 and this transport package is set to perform its first shipment in 2012.

INTRODUCTION

The Logistics Business Unit (BUL) of the AREVA Group is responsible for managing the transport of radioactive and nuclear materials for the other AREVA business units and for external customers. This includes comprehensive services such as supply of certified packages, logistics planning and transportation services. The BUL operates an extensive fleet of packages dedicated to materials across the nuclear fuel cycle and also manages and operates packages on behalf of the French Commissariat a l'Energie Atomique (CEA). Within this large fleet of packages, BUL identified a need for a (relatively) light-weight package to transport full-length, irradiated EPR pins that could

also be positioned to serve the PWR/BWR post-irradiation examination (PIE) market as well as the research reactor irradiated fuel market. For these markets, Transnuclear Inc., a U.S.–based company belonging to the Logistic Business Unit of AREVA, has developed a new innovative cask design.

PURPOSE

In the United States, as of today, commercial spent fuel assemblies are stored onsite due to the lack of either a central repository or reprocessing facility. Consequently, the market shipping needs are very specifics. They include research reactor fuel shipments, irradiated material shipments in connection with facility decommissioning and irradiated fuel pins for post-irradiation. Many of these shipments, particularly research reactor and Post Irradiation Examination projects, involve facilities with infrastructure constraints or unique interface requirements. The facilities may have smaller cranes or restrictive floor loading capacity and often require cask movements with impact limiters in place. The facilities can have small receiving bays and small or shallow pools. And hot cells have unique portals that often require cask adapters and can require vertical or horizontal cask operation.

Therefore, to address upcoming opportunities, Transnuclear, Inc. worked on a new light-weight cask design. This design maximizes capacity while maintaining total weight of the package (including its impact limiters) low enough so that it can be routinely used by research reactor and hot cell facilities. This new cask design carry irradiated PWR, BWR, MOX, and EPR pins, as well as research reactor fuel assemblies. The cask is also be capable of carrying full-size irradiated LWR assemblies, as well as non–fissile irradiated components.

An important consideration in this design project is to ensure that the cask can be certified in multiple countries in North America and Europe. Even if the regulations of countries are based on the same IAEA recommendations, interpretations and expectations can be different in various countries. To overcome these differences, it is important to understand and include them at the beginning of the design. The BUL has design and manufacturing expertise in Europe with TN International, in the United Sates with Transnuclear, Inc. and in Japan with Transnuclear, Ltd. Transnuclear, Inc. is leading this design project, but representatives from across the BUL are involved in design review to ensure that the design satisfies the requirements of various competent authorities and the constraints of potential customers around the world.

DESCRIPTION OF THE DESIGN

The new Transnuclear, Inc.’s cask, dubbed the TN-LC, is a right circular cylinder designed to accommodate the length of irradiated EPR pins, which are longer than most LWR reactor pins. The design consists of lead gamma shielding within stainless steel inner and outer shells and neutron shield resin encompassing the outside surface of the cask. To maximize cavity length, the cask lid and bottom forging also include lead shielding to reduce the necessary thickness of each.

As discussed above, the TN-LC is going to facilitate operations at sites with various infrastructure constraints. Although designed to carry full-size LWR assemblies and full-length EPR pins, the cask weigh a maximum of 25 metric tons loaded with impact limiters in place. This will ensure that the cask is useful to all but the smallest of facilities. The design incorporates “pocket” trunnions on the bottom end of the cask to eliminate protrusions that might complicate interfaces with narrow cask pits or mechanisms to position the cask in hot cell facilities. Additionally, the design includes a

small aperture on the bottom forging to allow the introduction of tools to allow push/pull insertion and ejection of contents, generally when the cask is operated at hot cells in a horizontal orientation.

CONCLUSIONS

AREVA's Logistics Business Unit has more than 40 years of cask design and manufacturing expertise. Our challenge is to ensure that the TN-LC design will be compatible with the interface requirements and constraints of different facilities around the world and the regulatory requirements of multiple countries. To meet this challenge, Transnuclear, Inc. is leading a design project team that integrates expertise from across the AREVA Group. This project team must communicate across language and cultural barriers to share information, to identify and understand regulatory differences and, consequently, to strengthen our final design. The TN-LC cask will provide a versatile packaging for the transport of irradiated nuclear material that will be useful to the commercial and research communities.

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