

A Canadian Experience in Updating Legacy Radioactive Material Transportation Spent Nuclear Fuel Type B Packaging with Current Regulations

Canada's nuclear sector has a long-standing history of transporting radioactive material. As the regulations have evolved, so has the design of the packaging used to perform the transportation. The Canadian Nuclear Safety Commission (CNSC) current requirements for the transportation of radioactive material are detailed in the Packaging and Transportation of Nuclear Substances Regulations 2015 which follows the IAEA Regulations for the Safe Transport of Radioactive Material, as amended from time to time.

Canadian Nuclear Laboratories (CNL) is Canada's premier nuclear science and technology organization. Our scientific expertise helps solve some of the world's biggest problems. This includes a large selection of packaging for the transportation of nuclear substances. This large selection of packaging has evolved as the regulations have evolved to meet our needs.

This paper presents a detailed case study of the Canadian experience in updating legacy Type B(U) packaging for radioactive materials including spent nuclear fuel, highlighting both the technical and regulatory pathways employed. The effort, led collaboratively by the Canadian Nuclear Laboratories, with technical service providers, and willing regulatory bodies open to discussion encompassed key activities such as leak testing, structural and thermal performance reassessment, material aging analysis, application of updated shielding and containment methodologies, and enhanced security considerations.

The paper outlines the challenges encountered in bridging the design and testing expectations of historical packages with modern regulatory criteria, and describes solutions developed to extend the service life of these packages while maintaining compliance with IAEA SSR-6 Rev. 1 requirements. Special attention is given to the use of engineering justifications, graded approaches to safety demonstration, and regulatory engagement strategies that facilitated efficient certification and continued safe operation.

CDN 2048 B(U)F AECL F-257 1973 Slowpoke

In 2018, CNL prepared an addendum intended to be used in conjunction with the original evaluation of the AECL-CP Shipping Package F-257 from 1986. The safety analysis report only had approval for Highly Enriched Uranium SLOWPOKE-2 cores. The new addendum demonstrates the use of the F-257 radioactive material transportation packaging for shipment of SLOWPOKE-2 LEU spent fuel core and supplements the existing safety analysis for the spent HEU fuel core.

The original safety analysis report demonstrated that the packaging met the requirements of the IAEA "Regulations for Safe Transport of Radioactive Materials," Safety Series 6, 1973 Revised Edition (as amended).

This addendum provided updates to meet the PTNSR, 2015 and IAEA 2012 Edition SSR-6. Package approved contents now include the spent HEU and LEU cores from the SLOWPOKE-2 reactors.

During the preparation of the addendum, CNL performed a detailed physical review of the packaging and performed repairs to the outer heat shielded and returned it to within the specifications.

CDN 2061 B(U)F-85 AECL IMT

AECL began the process to update of the IMT packaging in 2012 to meet the latest regulations. The original safety analysis report demonstrated that the packaging met the requirements of the IAEA Safety Series No. 006 1985 (as amended 1990). In 2019, CNL performed an internal review and prepared an addendum intended for continued operations which included several physical updates. The most significant update included physical changes to allow the packaging to meet the ANSI N14.5 2014, the American National Standard for Radioactive Materials –Leakage Tests on Packages for Shipments.

Currently, the latest safety analysis report update for the IMT is with the CNSC for review demonstrating compliance with the IAEA SSR-6 R1, 2018 also requesting an expanded approved content.

Other Packaging

Additional discussion will be provided regarding the CDN 2060 B(U)-85 Tritide packaging and the CDN 2052 B(U)-96 Used Fuel Transportation Packaging (UFTP).

Country or International Organization

Instructions

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