PIE Of The First Parallex Bundle

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ABSTRACT

The Parallex Project is a parallel experiment demonstrating the concept of dispositioning U.S. and Russian weapons-plutonium (WPu) in CANDU reactors as mixed-oxide (MOX) fuel. CANDU MOX fuel containing WPu were manufactured in both the U.S. and Russia to enable irradiation testing of three fuel bundles in the NRU reactor in Chalk River.

The first Parallex bundle contained MOX fuel elements supplied by the Los Alamos National Laboratory in the U.S. and by the Bochvar Institute in Russia. The MOX fuel pellets with 3.1% WPu in depleted uranium are contained in the intermediate and inner elements. The irradiation testing of the first bundle was completed in 2003. The MOX fuel elements experienced linear powers up to 42 kW/m and achieved a burnup of 380 MWh/kgHE.

Post-irradiation examination (PIE) of the first Parallex bundle was conducted to determine the performance of WPu CANDU MOX fuel. Based on the comparison of parameters such as fission gas release, grain growth, and sheath strains, no significant difference was observed between the performance of U.S.- and Russian-made MOX fuel. Minor differences in fabrication process variables including the process used to convert metallic Pu to oxide, milling/blending process resulting in slightly different levels of Pu homogeneity, and impurity contents, did not have a significant effect on the performance of this fuel. It was also found that the performance of CANDU MOX fuel containing WPu is consistent with previous MOX fuel experience. Details of the PIE results will be presented.