A Study on RUFIC Core Refuelling Simulation Using 4-Bundle Shift Scheme in CANDU-6 Reactor

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Abstract

A feasibility of the 4RUFIC fuel bundle shift refueling scheme was evaluated through the transition core simulation by changing from the existing 37-element natural uranium(ND) fuel to 0.92 w/o RUFIC(Recoved Uranium Fuel in CANDU) fuel and 1200 full power day (FPD) equilibrium core simulation for a CANDU-6 core. Considering that the discharge burnup of the RUFIC fuel is almost twice as that of the standpoint of the in-core fuel management. The transition and equilibrium core fuelling simulation results showed that the variations of maximum channel power (MCP) and maximum bundle power (MBP) as a function of FPD were maintained within the self-imposed operating limits, which are currently employed in Wolsong reactors. Maximum channel power peaking factor (CPPF) was maintained below 1.14 in all FPDs, which is set as the minimal margin of 8 % for the refueling in a Wolsong unit. As far as concerning the operating limits on the MCP, MBP, and CPPF, it is feasible to refuel the RUFIC fuel bundles in an operating CANDU-6 reactor with 4-bundle shift refueling scheme. Also, data on element power and element power-increase upon fuelling as a function of burnup were extracted and compiled for fuel performance assessment. It is shown that all the fuel element powers were below the SCC threshold curve for normal operation and for power-increase, except that the power boost for some of the ring-4 (outermost ring) elements are above the SCC threshold. Considering the fact that fuel defects occur when both the two envelop results violate the SCC threshold curve simultaneously, no defect of RUFIC fuel bundles is expected in the 4-bundle shift refueling scheme.