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2014 American Nuclear Society Annual Meeting

Options for a Sustainable MOX Fuel Cycle in PWRs for Rapid Utilization of Recycled Plutonium

Recycling spent nuclear fuel and reusing plutonium significantly extends the resource base for nuclear energy. Today's state of technology for manufacturing PWR MOX fuel and recycling reactor grade plutonium demonstrates the possibility and feasibility of the closed nuclear fuel cycle. During multiple irradiation cycles of MOX fuel, however, the concentration of Pu-240, Pu-241 and Pu-242 will grow with time. In previous research work we demonstrated measures for the design of a sustainable PWR fuel cycle where: 1) Physical properties of the MOX fuel will be similar to that of commercial uranium fuel and 2) Accumulation of Pu-242 and other plutonium isotopes will be balanced with proper feed proportions by transmutation of depleted and enriched uranium. That work showed the possibility of a sustainable MOX fuel cycle with multiple recycling for light water reactors. The goal of the current research is to investigate the possibility of the rapid utilization of recycled plutonium and approaches for the faster achievement of the sustainable material balance in a MOX fuel cycle.