

**TECHNICAL REPORT****Verification of MOX vs. LEU Spent Fuel Assemblies**

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A technique developed by LANL/USA was satisfactorily applied to verify irradiated MOX assemblies by distinguishing them clearly from LEU spent fuel assemblies of different irradiation cycles.

In LWR facilities, MOX fuel is being irradiated in PWR and BWR reactors, together with normal LEU fuel assemblies. A MOX BWR fuel assembly contains almost one significant quantity (8kg) of fresh plutonium. For safeguards purposes, it is important to verify that fresh plutonium is converted into spent fuel as a result of the reactor operation. The Grand Fork detector was used to measure neutron and gamma emissions from irradiated fuel assemblies. The measurements were performed two weeks after the assemblies were discharged from the reactor. The neutron and gamma rays ratios are used to check the consistency of declared irradiation history of MOX fuel after two cycles of irradiation and to differentiate it from the LEU irradiated assemblies with similar or different irradiation histories. The fork detector has been modified in order to operate in the intense gamma ray field emitted from short cooling time assemblies. It is feasible to use this procedure during the annual fuel reloading and maintenance period.

14 irradiated MOX assemblies with two cycles of irradiation, two LEU assemblies with two cycles of irradiation and one with four cycles of irradiation were measured at a boiling water reactor. The results obtained show that irradiated MOX assemblies can be successfully differentiated from irradiated LEU with a similar irradiation history and short cooling time (two weeks). LEU irradiated assemblies with a significant irradiation history (four cycles) and can be easily distinguished from irradiated MOX with lower burnup (two cycles). The method could be used to verify the Operator's declaration of irradiation history of both MOX and LEU fuel when it is necessary to re-establish the continuity of knowledge of this material in the core or in the spent fuel pond.