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**Conversion of Nigeria's MNSR And Lessons Learned From Operator
Perspective**

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ABSTRACT

The international efforts for the conversion of the Miniature Neutron Source Reactors (MNSRs) to LEU fuel and the return of the HEU spent fuel to China were initiated by the International Atomic Energy Agency (IAEA) through a coordinated research project (CRP) in 2006. The goal is to harmonize individual activities on the conversion of MNSRs with the objective of reducing and eventually eliminating the civilian use of HEU. On the expiration of the IAEA CRP, an international MNSR group was established in 2012 to continue the coordination of these activities.

The Centre for Energy Research and Training (Nigeria Atomic Energy Commission), Ahmadu Bello University, Zaria has been part of these international efforts from its inception. To support Nigeria Research Reactor (NIRR-1) MNSR conversion, a Basic Ordering Agreement (BOA) No. 6J-30081 was signed with Argonne National Laboratory (ANL)-Conversion Group on 26th November 2015 and a Blanket Master Contract (BMC) No. 00171972 was signed on the 17th May 2016 with Idaho National Laboratory (INL)-Removal Group. In addition, the IAEA receives Nigeria's formal request on 25th January 2016 to assist Nigeria with the conversion of its NIRR-1, supply of Low Enriched Uranium (LEU) material for the new core, and removal and transportation of the HEU core from Nigeria to China.

A positive response was provided by the IAEA on 15th March 2016, identifying that the requested assistance would be coordinated through the IAEA Research Reactor Section under the Department of Nuclear Energy. The IAEA also drafted a Project Supply Agreement (PSA) for assistance in securing LEU fuel for NIRR-1 and was later endorsed by the Government of Nigeria, China and the IAEA.

In line with these efforts, two technical coordination projects were implemented: (1) core conversion, which is related to the LEU loading; and (2) HEU core removal, which is related to HEU discharge. This presentation highlights the milestones achieved in the Nigeria's conversion program and most especially the site modifications done and the needed preparatory work for the HEU core discharge, LEU core loading, zero power test, packaging, licensing issues including package design approval, transport permits, import

and export licenses, and commissioning programs. We also discussed some of the lessons learned during the implementation process.