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**Neutronics Analyses of Dispersion Fuels as Alternate Fuels for the
Conversion of NIRR-1 to LEU using MCNP**

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ABSTRACT

As part of the on-going worldwide effort of converting Research Reactors from highly enriched uranium (HEU) cores to low enriched uranium (LEU) cores under the auspices of Reduced Enrichment for Research and Test Reactors (RERTR) program. The modification of Miniature Neutron Source Reactors (MNSRs) from 90% HEU cores to below 20% LEU systems has been embarked upon since 2006. In this work, a neutronics feasibility study of three dispersion fuels as alternate fuels to the UO₂ fuel has been performed using the MCNP code to determine their suitability for conversion commercial of NIRR-1 from HEU (90.2%) to LEU (<20%) fuel. The following reactor core physics parameters were computed for the LEU fuel options; clean cold core excess reactivity (ρ_{ex}), control rod (CR) worth, shut down margin (SDM) and kinetics data (i.e. effective delayed neutron fraction, β_{eff} and prompt neutron lifetime, l_p). Results are compared with experimental and calculated data of the current HEU core and indicate that it would be feasible to use any of the LEU options for the conversion of commercial MNSR in general and NIRR-1 in particular from HEU to LEU.