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Results of the MCNP Analysis of 20/20 LEU Fuel
for the Oregon State University TRIGA Reactor

by

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The Monte Carlo Neutron/Photon (MCNP) code has been used to perform the neutronics analysis required to support revision of the Oregon State University TRIGA Reactor (OSTR) Safety Analysis Report (SAR). The SAR revision is a necessary part of the preparation of the application for authorization to convert the OSTR core from High Enriched Uranium (HEU) FLIP fuel to a Low Enriched Uranium (LEU) fuel. Before MCNP was applied to LEU-fueled cores, it was first validated by comparing MCNP calculations on FLIP cores to historical, measured values for these cores. The LEU fuel considered was the 20 wt%, 20 % enriched (20/20) TRIGA fuel approved by the Nuclear Regulatory Commission (NRC) in NUREG 1282.

The results show that the 20/20 fuel is much more reactive than FLIP fuel. A just-critical OSTR FLIP core contains 65 elements, while a just-critical 20/20 core only needs 51 elements. Similarly, the current operational FLIP core consists of 88 elements, whereas a 20/20 core giving the same core excess only requires 65 elements. This presents a significant problem for the OSTR because of potentially significant neutron flux loss in experimental facilities. Further analysis shows that to achieve a full size operational core of about 90 LEU elements the erbium content of the LEU fuel would need to be increased from 0.47 wt% to about 0.85 wt%.