

FUEL HANDLING ACCIDENT ANALYSIS FOR THE UNIVERSITY OF MISSOURI
RESEARCH REACTOR'S HIGH ENRICHED URANIUM TO LOW ENRICHED URANIUM
FUEL CONVERSION INITIATIVE

Benjamin Rickman

Dr. John Gahl, Thesis Supervisor

ABSTRACT

The Fuel Handling Accident (FHA) analysis was conducted for the Low-Enriched Uranium (LEU) Safety Analysis Report (SAR) for the MU Research Reactor. FHA could be caused from a fuel handling event where a fuel plate is damaged or scratched severely enough to breach the cladding, or a simple failure of the fuel cladding due to a manufacturing defect or corrosion.

The Total Effective Dose Equivalent (TEDE) values were calculated in addition to the whole body dose and thyroid dose to operation personnel for both FHA events. Dose from fuel element failure from corrosion or pitting were calculated to be under 1% of the annual occupational limit. The LEU FHA scratch analysis occupational TEDE dose calculated to be 349 mrem, which is under occupational dose limit of 5000 mrem TEDE. All LEU FHA are encompassed by the established maximum hypothetical accident analysis dose of 403 mrem.

Abiding by NUREG-1537, the new analysis procedures used for the LEU FHA scratch analysis were validated by re-analyzing the high-enriched uranium (HEU) fueled FHA scratch analysis with the LEU FHA scratch analysis procedures. The calculated HEU scratch analysis occupational TEDE dose was 235 mrem, which is higher than the maximum hypothetical accident dose of 132 mrem that previously encompassed the HEU FHA scratch analysis. Therefore, the new procedures are more conservative than the previous.