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**Design and Engineering Considerations in the Fabrication of  
TREAT LEU Fuel Elements.**

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**ABSTRACT**

The Transient Research Reactor (TREAT) has been selected to resume transient testing operations by the DOE. Concurrently, Office of Material Management and Minimization is developing functionally equivalent low enriched uranium (LEU) bearing elements to replace the highly enriched uranium (LEU) bearing fuel elements. Critical parameters influencing a target performance that is equivalent to the former HEU fuel include the fuel block properties and the hermeticity of the fuel encapsulation to prevent oxidation of fuel material. The critical performance indicators considered in this presentation focus on the thermal performance, stress concentrations, and fabricability of the LEU fuel element assembly. Three subscale mock-up demonstration fuel elements were fabricated using the proposed fabrication processes to identify knowledge gaps in the critical parameters and performance indicators. Numerous lessons were learned with each fabrication and provided input into the design of the fuel element assembly facility and aid with assembly equipment specifications. Preliminary characterization results of alternative Zr-based alloys and graphite composites (UO<sub>2</sub>, U<sub>3</sub>O<sub>8</sub>, UC, ZrO<sub>2</sub>) are discussed. Finally, the presentation includes a brief outline of the LEU fuel element assembly qualification approach.