Title: Investigative Research on Design Parameters and Criticality Models for Microreactors

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Abstract:

With increased energy demand and the desire to reduce reliance on fossil fuels, nuclear power will need to play a prominent role in achieving carbon-free energy independence. Large nuclear reactors are necessary to meet this objective. However, they are expensive and take a long time to build. For remote locations (e.g., military bases) and smaller communities, large nuclear reactors would not be feasible or cost effective. Small reactors (microreactors) could fill this gap. These reactors would have to be factory-built, delivered, and operated safety. Simplicity in operation and inherent safety would be desirable attributes of these reactors. The objective of this research is to develop design parameters and criticality models for a reactor core that could be used in a microreactor. The reactor would self-regulate based on temperature. The following are some parameters and constraints for the reactor design that will be investigated:

- A reactor core fueled with TRISO particles, depleted UZrH, and graphite moderator.
- An enrichment between 10 wt.% and 20% U-235.
- A core diameter between 1 and 2 meters.
- A core reflected by steel
- A core achieving a critical state with a temperature range not exceeding 1000 C. The depleted UZrH matrix would provide a strong negative temperature reactivity feedback