A COUPLED NUCLEAR REACTOR THERMAL ENERGY STORAGE SYSTEM FOR ENHANCED LOAD FOLLOWING OPERATION

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Abstract:
Nuclear Power Plants (NPPs) usually provide base-load electric power and operate most economically at a constant power level. In a high-renewable energy grid, nuclear reactors may be subject to significantly variable power demands. A coupled Nuclear Reactor Thermal Energy Storage (Rx-TES) system may allow the reactor system to better respond to a variable power demand. In this system, a Prismatic-core Advanced High Temperature Reactor (PAHTR) operates at constant power. This power is supplied to a TES power block that provides power as needed to the secondary system (e.g. Brayton Cycle). The PAHTR is designed to have a power rating of 300 MWth, with 19.75 wt% enriched Tri-Structural-Isotropic UO2 fuel and a five year operating cycle. The passive molten salt TES system operates in the latent heat region with an energy rating of 150 MWd. This research project studies the behavior of the coupled nuclear reactor thermal energy storage system to determine the unique operational and safety considerations of this system.

BEAMLINE IMPROVEMENTS TO THE MINES NEUTRON RADIOPHGRAPHY (MINER) FACILITY

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Abstract:
The Mines Neutron Radiography (MINER) facility provides students and researchers at the Colorado School of Mines with the capability to perform neutron imaging at the Geological Survey TRIGA Reactor (GSTR). The current beamline consists of a 1.5 inch inner-diameter aluminum pipe routed from the reactor up to an experiment station in the reactor bay. Some limitations of the current system are a relatively small beam diameter which limits the size of objects which can be successfully imaged, and a tendency toward beamline misalignment, resulting in non-uniform fluxes and high radiation levels in the reactor bay. A second generation beamline, to be designed and built by this project, will overcome these drawbacks by having a larger cross-section to produce a larger usable area for imaging, and incorporating bolted flanges to produce a consistently straight beam. The current project focus is on simulating the new beamline with MCNP to provide a rigorous basis for the design. Of particular interest is devising a more-efficient-yet-still-reasonably-accurate source model to speed up the simulation process. The current methods of quantitative beamline characterization will be discussed.