U.S. DEPARTMENT OF ENERGY
NUCLEAR ENERGY RESEARCH INITIATIVE
ABSTRACT

PI: Bingjing Su **Proposal No.: 2000-100**

Institution: University of Cincinnati

Collaborators: Massachusetts Institute of Technology

Title: Design and Construction of a Prototype Advanced On-Line Fuel Burn-Up Monitoring System for the Modular Pebble Bed Reactor

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The Modular Pebble Bed high temperature Reactor (MPBR) has been proposed as a candidate to meet future needs of the nuclear industry, due to is safety, high-efficiency, and proliferation resistance. This type of reactor requires a unique on-line fuel burnup monitoring and handling system. This project will conceptually design and experimentally test an advanced on-line fuel burnup monitoring system for the MPBR. Compared with previous designs, this work proposes a novel approach to analyzing pebble bed fuel in real time using combinations of gamma spectroscopy and passive neutron counting of spontaneous fission neutrons in order to provide the speed, accuracy, and burnup range required for the MPBR. The real time results will be used to provide on-line automated go/no-go decision on fuel disposition on a pebble-by-pebble basis. Advanced design concepts included here are not limited to just the counting methods – also included are innovative concepts for handling pebble bed fuel in order to provide the throughput and reliability which this system will require.
