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

PI: **Daniel O'Conner** **Proposal No.: 99-0064**

Institution: **Oak Ridge National Laboratory**

Collaborators: **None**

Title: **Demand-Driven Nuclear Energizer Module**

The Nuclear Energizer Module (NEM) is an advanced reactor concept that would take advantage of newly developed materials with enhanced heat transfer characteristics and superb high-temperature mechanical properties to provide an inherently safe, self-regulated heat source. The high temperatures achievable make it suitable for a multiplicity of applications. Possible applications include electric power generation (conventional, MHD, and thermoelectric), isotope production and destruction, and hydrogen generation. The concept achieves demand-driven heat generation without the need of moving parts or working fluids. The nature of the reactor design makes the concept inherently safe, proliferation resistant, and ideal as a long-terrn, reliable source of power for harsh, remote, and/or inaccessible environments on Earth and space. Low-cost power generation is envisioned on a wide variety of temperature and power ranges.

This proposal addresses the nuclear technology areas of (1) reactors with higher performance and efficiency, (2) low output reactors, and (3) advanced nuclear fuel; and addresses, to a lesser extent, the nuclear technology areas of (4) proliferation resistant reactors and (5). management of nuclear waste.

Neutronics analyses will be conducted to evaluate fuel and reactor design and operating parameters. Materials research will be conducted to evaluate how the structural and thermal properties vary with density and radiation exposure. A physical model will be built using graphite foam, electric heaters, and a computer model to benchmark computer models, reflect neutronics and materials findings to evaluate reactivity coefficients and reactor configurations, and to simulate performance of reactor safety, stability, and instrumentation and controls. The resulting product will be an initial conceptual design for this reactor concept. At this point industrial leaders in the development of high-temperature reactors, such as General Atomic, would be brought in to facilitate a conceptual design.