

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

PI: Gary Polansky

Proposal No.: 99-0199

Institution: Sandia National Laboratories

Collaborators: Los Alamos National Laboratory, General Atomics, University of Florida,
Texas A&M University

Title: Direct Energy Conversion Fission Reactor

The research will establish the feasibility of developing reactors that directly harvest the energy of nuclear fission to produce electricity. This is achieved by directly capturing the energy of the fission fragments. As there is no intermediate conversion to thermal energy, the efficiencies of such reactors are not subject to classical thermodynamic limitations. The maximum efficiency of a direct energy conversion reactor is more than 80% and independent of temperature. As high temperatures and pressures are not required, large safety margins and passively safe design should be achievable. The combination of low pressure and temperature operation, integral power conversion, and modular design presents a unique opportunity to develop a low cost reactor system.

Concepts to achieve direct energy conversion were investigated during the late 1950s and early 1960s. Experiments conducted during that time period demonstrated the basic physics of the concept, but technical challenges limited the efficiencies that were achieved. Dramatic improvements in many relevant technological disciplines have occurred since this time, including computational mechanics, reactor pumped lasers, pulsed power, and space nuclear power and are directly applicable to this technology. This project will investigate the feasibility of direct energy conversion based on these technological advances.