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

PI: **Martin Grossbeck** **Proposal No.: 99-0074**

Institution: **Oak Ridge National Laboratory**

Collaborators: **None**

Title: **Development of Improved Burnable Poisons for Commercial Nuclear Power Reactors**

The burnable poisons used in power reactors to compensate for fuel depletion and aid in control suffer from two common disadvantages. The first is that the elements currently used, such as gadolinium and boron result in a small residual negative reactivity, and the second is that boron transmutes to helium which creates undesirable internal fuel pin pressures. Elimination or reduction of these two effects will lead to higher fuel burnup and longer core life resulting in lower cost of operation.

For many absorbing elements, such as gadolinium, it is isotopes other than the primary absorber that lead to residual reactivity. The proposed research will investigate the possibility of separating isotopes to isolate the absorbing isotope of interest, thus reducing or eliminating the residual reactivity. It is proposed to study absorbing elements such as samarium, gadolinium, dysprosium, and other identified candidates. State of the art two-dimensional computer codes will be used to determine the effects of the new burnable poisons, in both homogenious and self-shielded configurations, on reactivity and core safety parameters. The second phase of the project will investigate isotope separation by the plasma separation process, and test separations will be attempted. In the final phase of the project, product forms determined from phase one will be fabricated using techniques of ceramic processing.