NEER FY 2001 PROJECT ABSTRACT	
Grant Number:	01ID14117
Project Title:	An Advanced Poison Material for Burnable Poison Rod Assemblies and Spent Fuel Shipping Container
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Abstract:	The University of Florida (LTF) is proposing to carry out basic research on a new class of thermally stable boron containing materials that appear to have special properties which will greatly enhance the performance of Burnable Poison Rod Assemblies (BPRA) and also Spent Fuel Containers (SFC). The new polymer material, "carborane" is part of a class of materials developed by Dr. T. Keller of the Naval Research Laboratory (NRL). "Carborane" has the special properties of containing a tailored amount of boron, an extremely high hydrogen content, and being extremely stable to high temperatures. Tests run by the NRL1 have shown that "Carborane" is stable to 1000 C. A major fuel cycle penalty occurs with current generation PRA's from a reactivity loss resulting from the BPRA's displacement of moderator water in the guide tubes of Pressurized Water Reactor (PWR) assemblies. Current generation BPRA's utilize B4C in an A1203 matrix. In attempting to minimize the reactivity penalty from water displacement, Westinghouse has developed a costly annular BPRA, called the Wet Annular Burnable Absorber (WABA) assembly. This rod reduces the moderator displacement by 22% by the use of a central annular hole. The "Carborane" matrix proposed by the University of Florida reduces the water displacement penalty by 59% by the hydrogen present in the "Carborane". Initial studies2 by OF presented at the American Nuclear Society (ANS) 2000 Winter meeting showed that the use of "Carborane" as a burnable poison material increased fuel cycle length, decreased initial boron chemical shim concentration, and reduced maximum assembly power peaking. In addition to increasing margins, a cost benefit of approximately $500,000 per twoyear cycle is projected from reduced enrichments, no longer necessary to offset the water displacement reactivity penalty. In the case of SFC, the material current used is a borated polymer neutron absorber (NS4FR) which is not thermally stable. Use of the "Carborane" material would allow for a thinner layer to give an equivalent shielding effect and would maintain shielding capability in the event of the diesel fire accident, a situation that does not current exist with NS4FR. OF proposes to research the behavior of this class of materials under irradiation, to test the thermal stability of a range of tailored products. The tests will determine key physical properties, determine the cost and ease of manufacture of this material for nuclear needs, and perform detailed analysis of the use of "Carborane" in the fuel cycle and as a neutron shielding material in spent fuel containers.