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

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Institution: The University of Tennessee

Collaborators: Massachusetts Institute of Technology, Oak Ridge National Laboratory, Westinghouse Electric Company, Tennessee Valley Authority, Institute of Physics & Power Engineering (Russia), Newport News Shipbuilding

Title: Design and Layout Concepts for Compact, Factory-Produced, Transportable, Generation IV Reactor Systems

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Development and deployment of a new generation of nuclear electric power plants is urgently needed both within the United States and worldwide. The need for new electric power plants is very evident both to replace old power plants and to expand the power supply. While global warming is widely debated, there is a growing consensus that it is a potential worldwide problem and that generation of greenhouse gases should be avoided in new and replacement electric power plants. It is also clear that new nuclear power plants will not be readily accepted by the public until sufficient changes are evident to resolve economic, safety, waste and proliferation concerns. The public generally accepts nuclear power plants already deployed, but this same public will demand resolution of long-standing problems prior to deployment of new nuclear power plants.

Generation IV nuclear power plant concepts developed in the U.S. Department of Energy (DOE) Nuclear Energy Research Initiative offer the potential for resolving the problems that prevent the deployment of new nuclear power plants. Concepts for compact, modular , power plants have been developed with inherent design features to mitigate proliferation and safety concerns (1,2,3,4,5,6). The biggest concern for these compact plant concepts is economics. Can they be produced at an acceptable cost, and will they facilitate innovative financing and ownership arrangements to make deployment economically feasible?

The purpose of this research project is to develop compact Generation IV nuclear power plant design and layout concepts that maximize the benefits of factory-based fabrication and optimal packaging, transportation and siting. The potentially small footprint of Generation IV systems offers the opportunity for maximum factory fabrication and optimal packaging for transportation and siting. Barge mounting is an option to be considered and will offer flexibility for siting including floating installation, on-shore fixed siting, and transportation to nearby inland sites. Railroad and truck transportation of system modules will also be considered in this work.
