

**DEPARTMENT OF ENERGY'S
NUCLEAR ENERGY RESEARCH AND DEVELOPMENT AGENDA:
MOVING FORWARD ON GENERATION IV REACTOR DESIGNS**

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ABSTRACT

Nuclear power will be needed for future energy demands, which are expected to grow at different rates around the world. The opportunities for building new nuclear power plants around the world will depend on need, energy demand growth, and issues related to global warming and climate change. However, there are four major barriers to the expansion of nuclear power: economics, proliferation, safety, and waste. These issues must be addressed in the ongoing research and development of nuclear energy technology and applications. The evolution of nuclear power plant technology is presented as four distinct design generations: (1) prototypes, (2) current operating plants, (3) advanced light water reactor technology, and (4) revolutionary design concepts (i.e., Generation IV) that are now under development. The DOE Office of Nuclear Energy Science and Technology is sponsoring research with the Electric Power Research Institute that will address reliability, capacity, availability and life-extension issues for the currently operating power plants. The U.S. DOE Nuclear Energy Research Initiative (NERI) program is focused on the research and development of Generation IV designs that are safe, economic, proliferation-resistant, and will address current waste issues. NERI provides grants for independently peer-reviewed proposals from universities, national laboratories and industry for advanced nuclear research and development. Several NERI projects awarded in 1999 are described in terms of how they remove barriers to nuclear power plant expansion. Under the University Program's grants to nuclear engineering departments and programs, several research proposals have been funded that address basic nuclear science and engineering needs for current plants and Generation IV. Finally, the need for international collaboration for fourth-generation nuclear power technology development will be stressed, with particular reference to proliferation-resistant fuel designs and innovative reactor concepts.