

FUTURE RESEARCH NEEDS FOR REACTOR PHYSICS AND COMPUTATIONS - CHALLENGES AND OPPORTUNITIES

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ABSTRACT

The Office of Nuclear Energy, Science and Technology (NEST) at the U.S. Department of Energy is sponsoring and spearheading the research and development (R&D) needed for the next generation of nuclear power plants. The Nuclear Energy Research Initiative (NERI) program is focused on the R&D for next generation (Generation IV) designs that are safe, economic, proliferation-resistant, and reliable. The R&D related to solving the reliability, capacity, availability, and life-extension issues for the fleet of currently operating nuclear power plants is jointly funded with the Electric Power Research Institute in DOE NEST's Nuclear Energy Power Optimization (NEPO) program. In addition, the University Program provides Nuclear Engineering Education Research (NEER) grants and fellowships for nuclear engineering departments and programs in the United States. Several of the NERI and NEER grants awarded pertain to reactor physics methods development for specific applications related to next generation fuel cycles, reactor designs, and safety analyses.

This presentation will discuss where reactor physics research should focus for the next decade in order to be able to address issues for future reactor core designs. The necessary advances in code capabilities, accuracy and input cross section and group constants data will be addressed in terms of the needs for criticality calculations, reactor safety and performance analyses, design computations, new computational methods, and uncertainty analysis. With the high cost of performing benchmark experiments, the loss in the number of facilities to perform tests, and the need to demonstrate the accuracy of computational methods, the nuclear engineering community must consider how it will approach the next decade's challenges. The possibilities for research opportunities will be described, along with suggestions to encourage the audience to begin to think about what new and innovative approaches will be needed in the future.