



Nuclear Engineering Teaching and Research Facilities Upgrade at the University of Illinois at Urbana-Champaign

PI: James Stubbins- University of Illinois at Urbana Champaign **Collaborators:** NA

Program: General Scientific Infrastructure

ABSTRACT:

The objective of this program is to upgrade the facilities for nuclear material research at the Department of Nuclear, Plasma, and Radiological Engineering (NPPE) at the University of Illinois. The purpose of this facility development is to support on-going and future nuclear material research efforts and to advance the related educational program at the university. The project will directly support two ongoing NEUP IRP projects and two ongoing NEUP R&D projects. These projects can be divided into four major nuclear research areas, all of which will be supported by this facility upgrade program: (1) development of zirconium-based fuel cladding (both for advanced accident-tolerant materials - IRP -2 and long-term dry-storage for nuclear used fuels – IRP-1); (2) investigation of the creep-fatigue behavior for structural materials used in the next generation nuclear plant (NGNP) – NEUP R&D; (3) development of advanced austenitic oxide dispersion strengthened (ODS) materials for very-high-temperature nuclear systems; and (4) analysis on irradiation performance for Fe-Cr base steel – NEUP R&D. The facilities may also be used to support on-going efforts for the analysis of both ceramic and metal nuclear fuel materials. Several of the faculty members of NPPE will be involved in the use and applications of the proposed acquired equipment. These resources will be used for both teaching and research activities involving large numbers of undergraduate and graduate students. This facility upgrade program will also benefit, among other things, a larger group of investigators in two ongoing NEUP IRP projects with the collaborators at six other universities and three national labs in United States and an associate program in the UK.

The projects will provide an upgrade of the Nuclear Fuel Cladding and Structural Materials Analysis Laboratory at the University of Illinois. The requested equipment includes: an electrolytical polisher for bulk materials; an electro-polisher for the preparation transmission electron microscope (TEM) specimens; a perchloric acid laboratory hood (necessary for preparation of Zr-base materials and various stainless steels and ferritic alloys); and nuclear glove box.

The on-going research and student lab-based learning experience in NPPE will benefit substantially from this acquisition of experimental facilities and the improved capabilities of the Nuclear Fuel Cladding and Structural Materials Analysis Laboratory.