



Enhancement of Nuclear Engineering Technology Degree with a Web Based Generic Pressurized Water Reactor Plant Simulator

Applicant Name: Excelsior College

Project Director/Principal Investigator: Dr. Michael Johnson, Associate Dean, School of Technology

ABSTRACT:

This project will incorporate the Generic Pressurized Water Reactor (GPWR) simulator into five required courses in an online, ABET accredited Bachelor of Science in Nuclear Engineering Technology (BSNET) degree program to enhance student learning and improve nuclear workforce preparation. A minimum of 50% of the curriculum of four courses, and 75% of the program capstone, will employ simulation. Simulation will also teach cybersecurity for nuclear plants in two additional courses.

Project Description: Engaged in a minimum of 20 scenarios, students will apply scientific concepts such as thermodynamics, heat transfer and fluid mechanics, and reactor core fundamentals to reactor plant operations, becoming proficient in reactor operation and well-versed in the rules and regulations governing them. Students will develop hypotheses, run the simulator, document the applicable data, compare results, and develop a conclusion which will include a discussion of error analysis. Such applied learning will develop higher level thinking skills, resulting in long term retention of learning, and deeply engaging students in the profession. Evaluation will assess the effectiveness of teaching using simulation and guide revision. The web based nature of this simulator permits participation by students located across the nation as well as servicemembers deployed globally.

The BSNET has been recognized as a cutting-edge program since its inception. Excelsior participates actively in the Regional Center for Nuclear Education and Training and is an educational partner in the Energy Providers Coalition for Education. To expand access to the simulator, Excelsior will join the NSUF Partnership Program and collaborate with partner institutions. Nuclear industry professionals make up the College's Industry Advisory and Faculty Advisory committees and serve as adjunct faculty, ensuring that BSNET curriculum aligns closely to needs of the nuclear power industry.

Project staff will present what is learned regarding the educational value of the GPWR simulator including increased quality of instruction, interactivity, and improved assessment of learning at future conferences, and will demonstrate the lessons learned and best practices of teaching using the simulator for enhancing teaching and learning at other institutions.

Potential Impact of the Project: More than 1,200 students are enrolled in Excelsior's BSNET, comprised of adult learners from the U.S. Navy Nuclear Power Program, graduates of associate nuclear technology degree programs, and staff of commercial nuclear power plants. Servicemembers or veterans bringing nuclear training comprise 93% of the students – completing the BSNET retains their expertise in the nuclear industry while also preparing veterans for high paying careers with advancement potential.

Nuclear power is necessary to meet the energy needs of the nation, and education using simulation will increase the quality and rigor of the academic program to ensure the industry is supplied with a well-educated workforce. The Nuclear Energy Institute anticipates future demand for the hiring of 25,000 nuclear energy professionals over the next five years, a trend expected to continue in an industry whose workers average age is 49 - 50. Educational enhancement via simulation will ensure technicians are prepared to conduct safe and reliable operations, increasing public confidence in the nuclear industry.