Nuclear Energy University Programs
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Operations and Utilization Improvements at the PSU Breazeale Reactor

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Program: University Research Reactor Infrastructure

Collaborators: N/A

ABSTRACT:

The Penn State Breazeale Reactor has been providing neutron irradiation services, training, outreach, and education for over 65 years. The facility is well-maintained and is frequently upgraded, making it a model for what a TRIGA reactor facility can be. The Radiation Science and Engineering Center (RSEC), which houses the Breazeale reactor, also features hot cell laboratories, radiochemistry laboratories, and several gamma irradiators. The RSEC is a widely-used facility, supporting dozens of research projects, various classes, and over three thousand visitors each year. The RSEC staff have the capability of performing complex projects due to in-house radiochemistry, rapid prototyping, and electronics engineering expertise, and supports many critical infrastructure efforts such as the qualification of spent fuel pool neutron absorbers and radiation damage testing of space- and defense-related materials and electronics. Recently RSEC has performed experiments in the production of radiopharmaceuticals such as Ac-225 and will soon become the only university reactor in the United States with a small angle neutron spectrometer (SANS). These developments are expected to result in an increase in radiochemistry experiments and in reactor beam port utilization.

The objective of this project is to continue improving the reliability, safety, and research support capabilities of the PSU RSEC through a series of targeted improvements. First, a set of fission chambers and solid state neutron detectors with associated electronics will be procured to allow for the rapid measurement of neutron flux in the various in-pool and beamline irradiation locations to enable more efficient use and better knowledge of our neutron flux levels. Second, a new console uninterruptible power supply (UPS) will be installed to improve reactor reliability and avoid unexpected outages. Third, a reverse osmosis (RO) water system will be purchased to facilitate the efficient use of the facility for radiochemistry projects such as the production of radiopharmaceuticals. Fourth, a stainless steel ion exchange vessel will replace the existing vessel, which is over sixty years old and is a critical component of the reactor water system. Finally, a new digital signal analyzer and spectroscopy software will be used in the reactor's emergency operations center (EOC) to allow for the testing of water and air samples in a low-background environment accessible during reactor emergencies. This will improve reactor safety and reliability by upgrading the UPS, emergency HPGe, and ion exchanger, will decrease the time required to calibrate flux levels, and enable increased use for radiopharmaceutical / radiochemistry projects. The total project cost will be **$198,858.**