



Radiological Safety and Operational Reliability Enhancements at the Penn State Breazeale Reactor

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Collaborators: N/A

Program: University
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ABSTRACT:

The Penn State Breazeale Reactor (PSBR), the centerpiece of the Radiation Science and Engineering Center (RSEC), first went critical in 1955 and is the nation's longest continuously operating university research reactor. A new core-moderator assembly, reactor core upper and lower grid plates, safety plates, reactor tower structure, and new and geometrically aligned neutron beam ports were designed, constructed, and installed in August 2018. To fully utilize new beam ports with cold neutron source and installations of neutron guides for various experiments, a new neutron beam hall was constructed with PSU funds (\$9.4M). Our new upgraded and improved facility will offer unparalleled research opportunities for PSU faculty and graduate students in multiple disciplines while providing an excellent testbed for the development of instruments and experiments for researchers at PSU, as well as other regional and national university researchers, industry, and national laboratories. DOE NSUF leaders had a site visit recently, and we are now working to complete a MOU process in between NSUF and RSEC partnership. The addition of new neutron beam port facilities including a Small Angle Neutron Scattering (SANS) instrument (donated to Penn State by The Helmholtz-Zentrum Berlin, Germany - over \$9.8M value) with sample preparation laboratory, new time-of-flight neutron depth profiling, new prompt gamma activation analysis system, and new neutron imaging system in addition to the existing RSEC capabilities, will expose students to a range of important applications.

Due to new and expanded facilities for research and teaching activities we need to enhance radiological safety and operational reliability of the PSBR facilities. In this application, we seek DOE NEUP reactor infrastructure funds for enhancement of radiological safety and operational reliability of the Penn State Breazeale Reactor (PSBR) which is housed in the RSEC. The following equipment are needed for safe and reliable operation of the PSBR. Two Alpha/Beta Continuous Air Monitors (Mirion iCAM) to replace the several decades old AMS-3 units, two new hand, cuff, and foot surface contamination monitors, one for reactor bay and the other in the new reactor beam hall exit area, a spare control rod servo drive and motor mechanism. The funds requested for this application will enable us to safe and efficient utilization of the PSBR with expanded beam hall. The needed enhancements are very important for the safety of users of our reactor bay and new neutron beam hall. The safe operation of our neutron beam lines is also vital for the expansion of our research, instruction, and training capabilities. Development and utilization of new neutron beam techniques including a new SANS facility with sample preparation laboratory will significantly strengthen academic communities' infrastructure not just for nuclear engineering, but also material science, chemistry, biology, and physics. The PSBR will be the only university research reactor with SANS capability in the USA. We received all the quotes for the items, and all are submitted below. There will be no personnel or indirect charges to this project. All personnel and other charges are at no cost to this project. The total project cost will be **\$182,193**.