Upgrading the UT Austin Nuclear Engineering Teaching Laboratory Reactor Console and Instrumentation to Advance Nuclear Science and Engineering Research and Education

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Program: Reactor Upgrades

ABSTRACT:

The TRIGA Mark II nuclear reactor at the Nuclear Engineering Teaching Laboratory (NETL) of the University of Texas at Austin (UT) is one of the most heavily used reactor facilities in the US, typically operating over 200 days per year. Research at the facility includes materials analysis for advanced nuclear energy systems (including H measurements in U alloys), medical isotope production, and radiation effects testing. Several of the NETL missions are essential mission for the US and required NETL to maintain operation during the entire COVID-19 pandemic. The NETL instrumentation and control (I&C) system is outdated, unsustainable, and severely impairs the conduct of research at the facility. The current control system utilizes late 1980's computer and electronics components which are well past their expected lifetime and for which there are no replacements. The reactor is licensed at 1100 kW but due to serious limitations in the existing control system, the useable reactor power has been decreasing and is now operated at 900 kW. Instabilities in the I&C system leads to significant variations in fluence (±15%) delivered to samples when given the same reactor demand. It is only a matter of time before an unreplaceable component fails and the reactor will be forced into an extended shutdown. The NETL essential missions as well as nuclear research in general at UT would suffer catastrophically.

The objective of this project is to replace the original General Atomics (GA) integrated digital control and instrumentation system for the NETL reactor with a modern, reliable, enhanced and capable system to increase useable reactor power, eliminate the risk for catastrophic failure, and improve reactor safety. The original UT TRIGA integrated digital control and safety system will be removed and replaced with a current generation system by a vendor. The replacement will include enhancements in operational reliability and performance as well as better digital capability for incorporating technological advances (supporting aging management). Useable neutron flux will increase by as much as 20% by allowing for operation at or near licensed power. Operation will deliver a more stable flux to samples and decrease sample-to-sample fluence by at least a factor of two (2).

The vendor chosen for this project is Plantation Productions, Inc. which has extensive experience with GA I&C systems, including I&C system upgrades, software upgrades, and replacement of nuclear instrumentation. The vendor performed I&C systems upgrades, software upgrades, and/or power-level instrumentation upgrades at the DOW, USGS, AFFRI, Idaho National Laboratory (INL), 3 MW Bangladesh Atomic Energy Commission TRIGA II, and National Taiwan University TRIGA reactors.