Reactor Control Console Upgrade for the University of Utah TRIGA Reactor (UUTR)

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Program: Infrastructure

ABSTRACT:

Project Objective: The objective of this proposal is to replace UUTR control console by:

1. Replacing old SCRAM relay logic and annunciators. Replacing these will improve safety with annunciators that are easier to see and actuate, improve operational reliability with a new analog circuit less likely to fail, and improve operator training with clearer digital displays.
2. Replacing the controller for control rods and magnet supply. This replacement will improve long term operational reliability with easily replaceable parts. Automatic flux control will precisely maintain power at a set flux to improve experiments.
3. Replacing existing chart recorders with digital recorders. This will improve logging of key reactor parameters to improve safe operations, improve archival of key data, and improve student training with the ability to review reactor runs.
4. Replacing old and failing thermocouples, float sensors, water flow sensors, pH sensor, and conductivity sensors. This will provide accurate and reliable operator feedback for improved safe operation of the UUTR.
5. Provide new displays, data logging capability, and additional digital outputs. This will precisely log key parameters such as total fluence or temperature for more accurate experimentation measurements, easier to read displays for student training, and more detailed data for channel surveillances.

Description:

This proposal will improve safety, control, and operational reliability of the University of Utah TRIGA reactor (UUTR) by replacing the old and failing reactor control console with a new modernized digital/analog hybrid console capable of improving and expanding research, operating, and training capabilities. The 1960s console, originally from the University of California Berkley's TRIGA MARK III, moved to the University of Utah in 1998. The aged console threatens continued operation of the UUTR, due to the age of the instrumentation and the inability to procure replacement parts. In total over 22 failures of console electronics, including failed sensors, thermocouples, relays, control circuits, loose wiring, broken solder joints, battery backups, chart recorder, and failed detectors have caused over **387 non-operational days since 2013**. Replacement of the currently failing console will assure safe, reliable, and consistent operational capabilities for decades to come. The console replacement will increase the use of the reactor and expand research and training capabilities, supporting fundamental science, teaching of nuclear engineering, experiments, STEM outreach, and reactor operator training. The new hybrid console, similar to Kansas State University's console, will be built by Thermo-Fisher, providing a modern digital interface with clearer displays, digital outputs of console parameters, improved data archival capability, off-the-shelf replaceable parts for easier maintenance and repairs, and automatic flux control capability to improve experiments. This upgrade will target a wide community of beneficiaries from graduate students, to faculty, to other universities, DOE programs, and the nuclear engineering community with increased safe and reliable reactor operation time.