Project Title

University Research Reactor Upgrades Infrastructure Support for the MIT Research Reactor's Area Radiation Monitor System Upgrade

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Collaborators: N/A

Program: Infrastructure, Reactor Upgrades

ABSTRACT:

Objective: The objective of this proposal is to upgrade the reactor's area radiation monitor system to improve reactor safety, personnel safety, and reactor radiological emergency preparedness by replacing and expanding the existing area radiation monitor system with updated technology and equipment. Description: Funds of $898,769 are requested to procure a set of 29 radiation monitors. 12 of these 29 new monitors are energy-compensated, gamma-sensitive, solid-state radiation detectors, working in conjunction with local processing and display units, as well as remote alarm display units. These will replace the existing system which utilizes Geiger-Muller tubes that typically operate at ~500 volts. The solid-state detectors operate on 24 volts and are reliable and long-lasting based on their industrial record, with a mean time between failures in excess of 50,000 hours. 11 of the 29 will be deployed to new radiological work areas that have been developed since the last upgrade in the mid-1990s. These consist of "smart probes" which are energy-compensated small Geiger-Muller tubes, working with wide-range radiation monitors. Four of the 29 will be neutron monitors to be deployed in experiment areas where neutron scattering has been observed. Several new detector-and-display units will be deployed near the reactor operational and site boundaries. Two of these new units are lightweight, weatherproof monitors, needing only to connect to a network cable for their operation and signal transmission, thereby allowing mobility and flexibility in their placement. All 29 of the radiation monitors will have indications locally and remotely, except the latter pair, which are remote-only. This funding also includes licensed electricians for installation of network conduit and cabling, IT personnel for network setup and user interface, and manufacturer-provided engineering services including on-site final connection, testing, training, and initial equipment calibration. One of the key advantages of the new system is that personnel in off-site locations will be able to access all monitor readouts, allowing timely assessment of radiological conditions at the reactor site, thereby improving radiological emergency response times and preparedness. The replacement and new equipment will modernize radiation monitoring infrastructure for the reactor, improving personnel safety, operational reliability, and radiological emergency preparedness. The new system will have reliability, availability, and accessibility that the existing system cannot provide. Relevance and Outcomes: The MIT Reactor Technical Specifications require a radiation monitoring system, to ensure that facility personnel are alerted to the presence of radioactivity. The system ensures that the reactor's engineered safeguard features will preclude the uncontrolled discharge of radioactivity. Area radiation monitors shall be capable of warning personnel of gamma radiation

levels exceeding set points. The reactor's emergency electrical power system will provide for selected area radiation monitors in case of a loss of off-site power, in accordance with Technical Specifications. Additionally, routine channel checks, calibration, and trip set point verification will be performed by reactor staff in accordance with the Technical Specifications, thereby maintaining the area radiation monitor system in an operable condition. Documentation proving operability is subject to inspection by the U.S. Nuclear Regulatory Commission. The proposed upgrades will improve equipment reliability and enhance personnel safety by using components that meet modern standards. The improved equipment in turn allows more reliable reactor operation, which makes it possible to conduct experiments on a predictable schedule, to fulfill the research and education mission of DOE-NE and ATR-NSUF. The improved personnel safety makes the reactor facility more user-friendly for students and visiting scientists and engineers.