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The existing fluence monitor wire scanning system at the Advanced Test Reactor (ATR) was designed and installed for use in the Engineering Test Reactor (ETR) when it began operation in 1958. The wire scanner was operated in ETR for over 20 years until ATR began operation when it was moved to the ATR west canal area in 1971 and was subsequently moved to the west canal in 2006 where it presently resides. With a continued service life of 65 years the system is well beyond the typical design life of 20 years typical for these types of systems. This report identified the need to update the data acquisition and control system, and the benefits of replacing the existing sodium iodide (NaI) detector with an electronically cooled high-purity germanium (HPGe) detector.

The wirescanner system in the ATR canal is utilized after every reactor cycle by the ATR Radiation Measurements Laboratory (RML) to assess the activation of cobalt and nickel dosimeter wires during the cycle. These wires become activated through exposure to thermal and fast neutrons respectively during the irradiation cycle and are highly radioactive upon shutdown. It is for this reason that the wirescanner is used in the ATR canal rather than transporting the dosimeters to another facility.

A scoping study was performed to develop a base-line design to ensure that existing capabilities could be replaced with a new system. The new hardware will enable automated measuring of several flux monitor holders without necessitating the removal of the flux wires. In this way, flux wire measurements will be performed with minimal dose to the technicians and will not be limited by canal operations as is presently the case. The new control and acquisition software will be based on commercially available and supported systems that have a wide user-base to provide long-term stability. An electronically cooled (HPGe) detector will be used to provide high-resolution gamma-ray measurements, an improvement from the low-resolution sodium-iodide detector that is presently deployed. The electronic cooler eliminates the need for liquid nitrogen to cool the detector head. A new collimator has been designed to house the new detector and allow for sufficient counting rates.