

NE-19-19013, Testing of Instrumentation and Control Sensors and Cables for Small Modular Reactors

Analysis and Measurement Services Corporation (AMS) conducted several traditional thermal aging tests on five energized cables constructed with various high-temperature radiation-resistant insulation materials including a four-conductor mineral insulated cable that is under consideration for use in small modular reactor (SMR) applications. AMS also designed and constructed a small high-temperature vacuum chamber to perform follow-on testing at conditions more closely resembling those of an SMR containment. However, this custom-built chamber can only accommodate a few small gauge cables and cannot maintain high-temperature vacuum to the degree needed to accomplish the test objectives. In order to generate more useful data for instrumentation and control (I&C) cable derating purposes, AMS needs access to the specialized vacuum test chambers and high voltage/current power supplies available at Oak Ridge National Laboratory.

The data collected from this access will help sensor and cable manufacturers design products with enhanced performance characteristics necessary for SMR and advanced reactor applications. Furthermore, the development of new in-situ I&C test technologies will improve both the safety and economic competitiveness of currently operating reactors as well as next-generation reactors through increased condition monitoring and reduced hands-on maintenance (which contributes to high operating costs for nuclear power plants). Next-generation reactors are under consideration in the U.S. for electricity generation in remote locations and/or for military installations, co-generation with renewables for grid stabilization, hydrogen production, and water desalination among others. The products of this effort will help realize the benefits of advanced nuclear energy in the U.S.