

## **Accelerated Cable Aging to Predict Service Life: Thermal Aging vs. Oxidation Induction Time (OIT)**

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### **Abstract**

Throughout the development of a nuclear power cable a single demanding test, the two year thermal aging, will determine the cables service life. Six different cable insulations that have been qualified as nuclear power cables in accordance with IEEE 98 and 101 were reevaluated with Oxidation Induction Time (OIT). Using ASTM D 3895 OIT results were obtained at a minimum of three different temperatures. Arrhenius OIT plots were then constructed to compare service ratings between OIT and thermal aging. In several cases when comparing the thermal aging plots with the OIT plots the latter would yield a superior temperature rating when projecting a 60 year life. On average the OIT temperature predicted would vary from the thermal aging temperature by an average of 11.86%. When testing with OIT at higher temperatures, higher activation energies were observed. One cable insulation in particular was chosen to undergo additional testing to evaluate reproducibility and to illustrate confidence in the service rating. The thermal aging for this insulation was rated at 60 years and 80.0 oC. The initial OIT rating at 60 years was 71.6 oC. After a larger sample size was conducted, when using the average OIT for each temperature the service rating was now 77.5 oC. However, when analyzing two standard deviations from the mean the service rating would range from 104.2 CC – 60.2 oC. During the study all samples were created using the same technique. However, two additional methods were briefly explored as trials. These trials continued to show the inconsistency when using OIT. At this time it is not possible to provide a service life for a cable using OIT with confidence when compared to thermal aging.