

**C5.6****Fourth generation dielectric enhancement technology**

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Current third-generation dielectric enhancement fluids have demonstrated over 11 years of field reliability in excess of 99.5%. Previously published accelerated aging results with third-generation materials suggest that 20 years of reliable life can be added to the end of the useful life of polymeric cables, which are failing due to the growth of water trees. Cables with water trees which span 100% of the width of the insulation layer can be restored to dielectric performance near that of new cables. Two new classes of materials are discussed along with the proposed mechanisms by which both AC breakdown strength and mean time to failure can be substantially increased. These two new classes collectively represent a fourth generation of technology and provide some intriguing insights into the mechanisms of water tree formation and the conversion of water trees to electrical trees.