2014 IEEE Herman Halperin Electric Transmission and Distribution Award

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Mr. Boone started his career in 1963 with KEMA, studying the insulating properties of dielectric liquids followed by the investigation of a new synthetic paper material (TENAX), as a replacement for cellulose paper in the well-known self-contained fluid-filled (SCFF) cable. He performed investigations on future possibilities and limitations of such synthetic paper material. The final practical result was the introduction of a compromise between synthetic and cellulose paper-polypropylene-paper laminate (PPL) insulating material which could be used at higher operating electric stresses than conventional paper insulation. PPL is now successfully used in HPFF and LPFF cable systems.

After the investigations in new materials Mr. Boone became active in another development to improve the current rating of SCFF cable by the application of forced cooling. From the late seventies Mr. Boone was the leading member in the construction and operation of a pilot project at KEMA on forced cooling. The application of this method can increase the power capacity, decrease the cost/MVA, and decrease the losses by using the warm water for useful purposes. In the Netherlands this technology is recently successfully applied by the Dutch Transmission System Operator TenneT to equalize local hot spots in directional drilling of a 400 kV transmission cable system.

Consecutively Mr. Boone became active in a new development of solid insulated or extruded cables, at first polyethylene (PE) at the distribution level and gradually cross-linked PE (XLPE) for higher voltages. Early vintage cables began failing prematurely after about 5 years in service due to deterioration referred to as water treeing. Mr. Boone worked on the development of a number of important tests related to water tree detection on both aged and new cables. For aged cables they developed a characterization test that enabled cables to be classified into different levels of severity of water treeing. This helped utilities to decide if particular vintages of cables should be replaced or continue in service. For new cables it was important to develop an accelerated ageing test that indicated the susceptibility of new cable to water tree degradation under normal operating conditions. As many accelerated ageing tests took a very long time (up to 2 year), an important improvement was achieved by ageing the cable at high frequency (500 Hz), which reduced the ageing time to 3 months and did not change the ageing mechanisms. The high frequency test has been recognized internationally and is included in the relevant CENELEC standards.

Since the nineties Mr. Boone has been involved in the application of diagnostic testing of cables and related condition assessment, condition based maintenance, remaining life, and life extension. This is an important issue for most utilities that have cable systems that are approaching the end of their predicted life. In particular in the USA, the 0.1 Hz technology for partial discharge detection in paper-insulated lead-covered (PILC) cable systems, including accessories, proved successful as an effective condition assessment tool. The existing technology was improved by introducing advanced satellite synchronization to test very long cable lengths (>10km) and to test branched circuits. Mr. Boone was for about 8 years directly managing the 0.1 Hz cable testing service for MV cables in the USA, serving a large number of utilities.