

## First Russian Long Length HTS Power Cable

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**Abstract** — The Russian R&D Program for superconducting power devices is underway, supported both by government and electric power companies. In this program R&D on HTS power cables is considered as most advanced and close to commercialization. In the framework of the Program, several heavily instrumented 5 m cables have been tested followed by the 30 m - 3 phase experimental power cable development and testing in 2008-2009. The latest achievement is the development and testing of the first long length 3x200 m power cable with rating 1.5/2kA – 20 kV. In parallel with the cable development an innovative cryogenic system has been also developed for the cable cooling. The system is using neon as the working substance and radial turbo-machines in the refrigerator. Cooling power is up to ~8 kW at 65 K, the inter-maintenance time ~30 000 hours. The cryogenic pump with superconducting motor can be used to provide subcooled liquid nitrogen flow of ~0.1 to 1.5 kg/sec at 0.1 to 2.5 MPa pressure. After extensive tests at a special test facility, the HTS power cable and its cryogenic system should be installed at some substation in the Moscow utility grid. In this review, we present some details of the Russian HTS power application program, the 200m cable and its cryogenic system design. Tests results are also presented.

**Keywords** - HTS power cables; Cryogenic systems; Cooling, HTS motors

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