

## Abstract

### **High-capacity high temperature superconducting power cables Jean-Maxime Saugrain, Nexans Corporate Vice President Technical**

Conventional cables, made of copper or aluminium, do not carry more than 2000 A. Much larger currents are now achievable thanks to the use of high temperature superconducting (HTS) tapes as current carrying elements. High-capacity alternating current (AC) HTS cables are therefore being developed around the world. The most advanced demonstration project is the 600-meter, 138 kV, 2400 A HTS cable commissioned in Long Island in 2008 but new developments are being carried out to increase current up to 5000 A and voltage up to 275 kV. AC cables with a capacity of 1 GVA at 110 kV or 2 GVA at 220 kV can for instance be envisioned. However, two types of technical hurdles will have to be overcome. First, high-current HTS tapes are highly desirable in order to avoid mechanical and current distributions issues between cable conductor layers. Second, developing cable terminations and joints for large currents and/or high voltages will make the management of thermal constraints and electrical losses more complex.

High voltage direct current links, which are becoming more and more popular for grid interconnections and connections of renewable energy sources, constitute an even more promising field for HTS materials. Huge currents, beyond 10000 A, could be transmitted at reduced loss, the efficiency gain in the cable itself overcompensating the cooling system consumption.

