

Long Length HTS Cable with Integrated FCL Property

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Abstract - The past years have shown the growth of bottlenecks in electric power grids, among other reasons caused by the increasing demand of energy in the form of electricity and by the large-scaled integration of renewable sources. As solving of these challenges by means of traditional solutions appears to be more and more problematic, the need for new technology solutions has become apparent. The HTS cable technology demonstrates a great potential in solving of grid congestion issues. In addition to their large power transport capacity and low losses, modern-generation HTS cables also have an integrated fault-current limiting (FCL) property. Applications of such cables in power grids will help to solve fault-current issues when connecting new generators, and dispersed and large-scale renewable sources. As HTS cables, used in current projects, are limited to hundreds of meters in length, they have still not been used for energy transport over long distances. The Dutch DSO Alliander, together with Ultera, is working on the development of a 6 km FCL HTS cable for installation in the Alliander's HV grid. In order to get the low-loss benefits of the HTS technology, a cooling system with a high efficiency is needed. The FCL HTS cable will be cooled by one cooling station at each end of the cable, using a liquid nitrogen coolant. Alliander and Ultera have established and work to achieve technical performance targets believed to be required to realise a 6 km long, 50 kV retrofit system with a power rating of 250 MVA with cooling stations only at the two ends of the cable system. These targets aim to reduce the superconductor's AC loss at a nominal current, reduce the heat leak of the thermally insulating envelope, increase the voltage rating and re-duce the friction coefficient of the coolant flow.

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