World-longest Superconducting Power Cable Inaugurated

June 30, 2014 (HE89). On April 30th, 2014, the German energy company RWE inaugurated officially the worldwide longest superconducting cable connecting two transformer substations in the center of Essen, a large industrial city in the German state of North-Rhine Westphalia (NRW). This grid pilot project is known under the name "AmpaCity" and represents a practical test of future energy transmission technology in centers of large cities. The official inauguration occurred a year after the start of trenching to install the one-km-long cable. The AmpaCity project should now serve as a worldwide role model for development of electrical grids in large cities.

The AmpaCity 10 KV three-phase AC concentric cable is designed for 40 MW power transmission and operates near the temperature of liquid nitrogen. Thanks to very low AC losses in the superconductor, and in spite of energy consumption by the necessary cryocooling sub-system, the whole cable system is overall less lossy than a conventional cable of the same power rating. In Essen, the 10 kV cable replaces a traditional 110 kV AC cable.

The AmpaCity project is part of the study of technical feasibility and economical viability of medium –voltage superconducting power transmission in cities. Superconducting cables may permit to largely reduce the use of high-voltage lines in urban grids, simplify the grid structure and partly eliminate transformers thus saving space and resources. Conventional (normal) medium-voltage cables have too high ohmic losses to be practical. The grid trial operation is planned for two years. If it succeeds, a large part of Essen high-voltage distribution grid may be in the future replaced by superconducting cables. That should lead to (medium-term) higher efficiency, distribution grid reduction and lower operational and maintenance cost with reduced space requirements.

The present project was made possible by grants of the German Federal Economics Ministry for the Environment and Energy (BMWi). In fact, BMWi contributed € 5.9 million to the € 13.5 million invested in the project by RWE and its project partners. They are the cable manufacturer Nexans and the Karlsruhe-based Institute for Technology (KIT). Nexans also designed a superconducting short-circuit current limiter as part of the trial. KIT provides scientific assistance.

The German federal government justifies the research funding as a measure designed to meet the technological challenges posed by the energy transition for all players in the energy system. The AmpaCity pilot project was selected and supported by BMWi as an excellent contribution under the overall energy research program.

This highlight was prepared by SNF based on the announcements by RWE (in German) and Nexans. Technical details are from the Nexans press release in French. We hope to publish in near future a technically more detailed description of the project.