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World Record in Current Intensity Achieved With Distribution Cables

Researchers at Universitat Autònoma de Barcelona, ICMAB-CSIC, and the firms Labein Tecnalia and Nexans, coordinated by the electrical company Endesa, have constructed a 30m cable and the terminals needed to connect it to the network using the high-temperature superconducting material BSCCO. This is the most advanced cable in terms of distribution (24 kV), since its current value is higher than that obtained up to date, 3200 Amperes RMS, and therefore can transport the electrical strength of 110 MVA, i.e. five times more than a conventional copper cable of the same dimensions.

The superconducting electric cable could reduce energy loss by 50% and even by 70% in some parts of the distribution network. Reduction in loss represents energy saving and a significant decrease in CO_2 emissions in the present distribution of generation of the Spanish electricity system.

The fact that superconductor technology transports a larger amount of electricity than conventional systems makes it a viable alternative to the efficiency needs of the world's electrical systems, which presently channel 40% of the world's total consumption of energy. Energy demands are expected to double by the second half of this century. Thus the construction of more efficient motors, generators, transformers and superconducting cables would help to satisfy this demand in energy and at the same time reduce the emission of greenhouse gases.

In fact, transporting electricity with superconducting materials represents important benefits for the environment, since it will contribute to the global reduction of greenhouse gas emissions even if there is an increase in both the global population and the use of energy, especially in developing countries. The use of superconductor electrical systems could easily reduce primary energy consumption by 10-15%, with no decrease in final user consumption. This is due to the fact that 60% of the energy presently produced is wasted, which demonstrates that there is yet much to do to improve on energy efficiency. In the case of Catalonia, with a yearly energy consumption of approximately 40,000 GWh, implementing superconductor technology throughout the country could reduce its yearly emissions of carbon oxide by 500,000 tonnes.

The technology based on superconducting materials also increases the security and reliability of network installations, given that these transformers are non-flammable. Current restrictions would be easier to apply as well, which allows for a greater control of the network.

The project was carried out with the participation of UAB Department of Physics researchers Àlvar Sànchez, Carles Navau, Núria Del Valle and Chen Du-Xing. Coordinating the project was Xavier Obradors, researcher at the Institute of Material Science of Barcelona (ICMAB-CISC), UAB Research Park.

Source: Adapted from materials provided by Universitat Autònoma de Barcelona, via AlphaGalileo