

The Prospect of Carbon-Neutrality-Driven Energy and Power and the Possible Application of Superconductor

Liye Xiao

Institute of Electrical Engineering, Chinese Academy of Sciences, Beijing, China

E-mail: xiao@mail.iee.ac.cn

Abstract—In order to mitigate the speed of climate change, most countries in the world are making efforts to develop renewable energy and strive to achieve the goal of carbon neutrality around the middle of this century. Renewable energy, mainly solar energy and wind energy, is intermittent, volatile, non-schedulable and geographically non-translatable, and its main use mode is to generate power. Then, its large-scale replacement of traditional fossil energy will bring a series of major challenges. In order to meet the challenges, a series of new technologies need to be developed. Superconducting technology has many potential applications in the future energy and electric power.

China is the country with the largest energy and power consumption in the world, and has been dominated by coal for a long time. The pressure of its energy transformation is enormous. However, China has set the goal of achieving carbon neutrality by 2060. China is also a country with a vast geographical area and load centers are far away from the renewable energy centers. Therefore, all kinds of new energy technologies including superconductor technology are bound to be of great use in China. Recently, superconductor technology for energy and power have been well developed in China. In this talk, an overview of the progress in China would be also presented. For examples, superconducting power cable, energy pipeline, DC fault current limiter and wind power generator and synchronous condenser, would be discussed and shown in the talk.

Keywords (Index Terms)—Carbon neutrality, renewable energy, future power grid, superconducting power cable, energy pipeline, fault current limiter, synchronous condenser

Plenary presentation given at MT-28 2023, September 10-15, 2023, Aix-en-Provence, France