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Recent Progress, Challenges and Outlooks of Insulation System in HVDC

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The insulation system is a critical component of High Voltage Direct Current (HVDC) transmission and transformation projects, which serve as the primary engineering means for the utilization and integration of new energy resources. The reliability of these insulation systems directly impacts the safety and economic efficiency of both power equipment and the grid. Consequently, in recent years, we have seen growing interest in the aging and breakdown of dielectric materials under DC voltage, the design and manufacturing of HVDC insulation equipment, and the interaction characteristics between insulation systems and their operating environments. Additionally, the detection and diagnosis of HVDC insulation, the specific impacts of DC electric fields, and the integration of emerging technologies, such as artificial intelligence and big data, have become compelling topics for power and energy researchers. This reprint aims to present and disseminate the most recent advances related to the phenomenon, theory, design, modelling, application, and condition monitoring of all types of insulation systems, including materials, devices, and projects.

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