

Study on Arc Protection for CEPC High-Voltage Direct Current Long-Distance Transmission

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The CEPC high-voltage direct current (HVDC) power supply and the klystron are connected via a long-distance HVDC cable. When an arc short circuit occurs in the klystron, the energy generated by the discharge of the distributed capacitance in the long-distance transmission cable can directly damage the klystron. To address this, a high-voltage direct current long-distance transmission arc protection device has been developed. This device has a voltage rating higher than 120 kV and, when an arc short circuit occurs in the klystron, triggers the Crowbar device to instantly bypass and discharge the energy. The response time of the device is less than 5 microseconds, and the energy is limited to within 10 joules. This paper will analyze the discharge energy of the distributed capacitance in long-distance cable transmission based on the layout of the CEPC HVDC power supply and the klystron, establish a circuit model, conduct system simulations and energy calculations, and systematically analyze the design principles and key technologies of the arc protection device.

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