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Thu-Mo-Po4.11-10 [83]: Characteristics of a Current-limiting DC circuit breaker with a superconducting coil applied to the commutation circuit

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Since DC has no current zero point, an arc occurs when the DC circuit breaker performs a cuf-off operation. In this case, a fatal fault may occur in the circuit breaker or in the grid, due to the magnitude of the arc. Therefore, the cut-off operation and the reliability of the circuit breaker are important in the commercialization of HVDC. In this paper, a current-limiting DC circuit breaker combined with a superconductor coils was proposed to improve the performance and the reliability of the DC circuit breaker. The current-limiting DC CB applied a superconducting coil to the inductor of the existing a commutation circuit of DC circuit breaker. Other than limiting the initial fault current, it also creates a stable current zero point in the event of a fault current. To verify this, simulation was performed through EMTDC/PSCAD. Furthermore, the current-limiting DC CB was compared with the DC circuit breaker with a commutation circuit of normal coils.

As a result, it was found that the current-limiting DC CB with the superconducting coil limited the initial fault current further by approximately 12 kA compared to the DC circuit breaker with a normal coils. This reduced the arc extinguishing time by approximately 0.2 sec, thereby decreasing the mechanical burden on the circuit breaker.

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