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A Hybrid-Arm Modular Multilevel Converters Topology with DC Low Voltage Operation and Fault Ride-Through Capability for Unidirectional HVDC Bulk Power Transmission

a novel Hybrid-Arm Modular Multilevel Converters (HA-MMCs) topology with DC low voltage operation and fault ride-through capability is proposed for unidirectional HVDC bulk power transmission. The HA-MMCs topology is a combination of two types of converter arms: the Half-Bridge Sub Module based arm (HBSM-arm) and the Diagonal Bridge Sub Module Based Arm (DBSM-arm). Replacing the traditional HBSM-MMC, the HA-MMCs are operated in current and reactive power control modes during normal conditions and can work as the rectifier or the inverter. Since the DBSM can provide bipolar voltages with unipolar currents, the HA-MMCs need not change its control strategy under DC low voltage conditions caused by the high-impedance faults. Under DC pole to-pole or pole-to-ground faults, the HA-MMCs can both clear the DC fault current and work as the Static Synchronous Compensator (STATCOM) to provide reactive power to support the AC grid. Compared with other MMC topologies with DC fault ride-through capability, the HA-MMCs topology is more economical for significantly decreasing the number of power devices. The operation states, control strategy and DC low voltage operation capability of the HA-MMCs are presented and simulation results of the LCC-HA-MMC hybrid system

Domain: Power Electronics / Multilevel Converters

Technology: Electrical