

Triple jumps of XLPE insulated HVDC cable development in China: - from 160kv, 200kv to 320kv

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HVDC transmission technology has been well recognized due to its significant advantages over the HVAC in terms of transmission capacity, transmission distance and transmission losses. With the technology advancement of VSC (Voltage Sourced Converter) and engineering application, research and development on HVDC cable has been initiated since 2012 because of the first industry application including the research of the insulation materials, design, manufacture and tests of DC submarine power cable and factory joint and cable accessories as well. Under the specification of TICW (National Quality Supervision and Inspection Center of Wire and Cable) for DC power cable, Zhongtian Technology (ZTT) as a pioneer in China has succeeded in $\pm 160\text{kV}$, $\pm 200\text{kV}$ and $\pm 320\text{kV}$ DC power cables for domestic and overseas commodity market. In December 2013, $\pm 160\text{kV}$ DC submarine and land cable with a total length of 37 km was put into operation in a three-terminal VSC DC transmission project for the connection of Nan'ao island wind farm to the onshore grid of China Southern Power Grid. In June 2014, 294 km $\pm 200\text{kV}$ DC submarine power cable also came into service in Zhoushan multi-terminal VSC DC transmission project owned by State Grid. Another VSC project at the voltage level of $\pm 320\text{kV}$ is under construction in Xiamen within State Grid of China, in which a cable with the length of 21 km will be deployed and the relevant prequalification test is in progress. The project is expected to come into service in October 2015. On the completion of three projects within three years of time China has realized triple leap in its HVDC submarine and land cable development. The paper presents the technical achievement of XLPE insulated HVDC cable development in details of material characterization, space charge behaviour, degassing processing and testing considerations. Their application in three projects is briefed as well to illustrate the insulation and coordination design by considering each individual transmission system.