

PREQUALIFICATION TEST OF 500 KV XLPE CABLE SYSTEM IN CHINA

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ABSTRACT

The prequalification test of 500 kV XLPE cables and accessories has been successfully finished at SGEPRI(State Grid Electric Power Research Institute)in partnership with two cable & accessory manufacturers, SFC and VISCAS. The prequalification test program was aimed at assessing, for the first time in china, the long-term reliability of the 500 kV cable system and in particular the prefabricated joints. The cable system were installed in representative arrangement simulating actual installation conditions used in the underground cable network of China. During the 8865 h long-term test with daily thermal cycling to a maximum temperature of 95 °C ,many parameters like the voltage, heating current, surface temperature, and SF₆ pressure were monitored. Following the long-term test at 493 kV, lightning impulse tests were firstly performed on the complete cable system, and then on the 3 samples cut from the test cable system. The final examination showed that no macroscopical electrical degradation, moisture ingress, leakage, corrosion or harmful shrinkage was found in the cable and accessories.

KEYWORDS

500 kV; XLPE cable system; Prequalification test;

INTRODUCTION

Power cables and their accessories for rated voltages above 150 kV up to 500 kV are considered as extra high voltage (EHV) cables and their accessories by CIGRE documents. EHV power cables with extruded insulation and their accessories are the very important component of the power transmission system, and therefore reliability considerations are of the highest priority. These cables and their accessories operate under higher electrical stresses than those up to 110 kV and, as a result, have a smaller safety margin with respect to the intrinsic performance boundaries of the cable system. Such cables and accessories have a thicker insulation wall than those up to 110 kV and, as a result, are subjected to greater thermo mechanical effects. The design and coordination of the cables and accessories becomes more difficult with increasing system voltage level.

One of the main tasks of the Extra High Voltage Cable Test Lab, which was invested by the former State Power Corporation of China (now is State Grid Corporation of China) and built up at the former Wuhan High Voltage Research Institute (now is State Grid Electric Power Research Institute, SGEPRI), is to perform the prequalification tests in order to demonstrate the long-term performance of EHV cable systems and to verify the cables and their accessories installation methods to be employed before those are used in state power grid of China, according to the requirements of IEC 62067:2006^[1]

and GB/T 22078—2008^{[2] [3] [4]}.

This paper presents the prequalification test of 500 kV XLPE cables and accessories has been successfully finished at SGEPRI in partnership with two cable & accessory manufacturers, SFC and VISCAS. The prequalification test program was aimed at assessing, for the first time in china, the long-term reliability of the 500 kV cable system and in particular the prefabricated joints.

CABLE SYSTEM TESTED

The power cable system tested was consisted of porcelain outdoor termination, compound insulation outdoor termination, prefabricated composite straight joint, prefabricated composite insulating straight, Dry-type insulation GIS terminations and power cables.

Cable

Name: 500 kV copper conductor cross-linked polyethylene insulation extruded corrugated aluminum sheath PVC outer-sheath power cable; Type: YJLW02 290/500 1×2500; Manufacturer: SFC (Shenyang Furukawa Cable Corp., LTD.). Figure 1 shows a cross section of the power cable submitted to the prequalification test. The main constructional details are summarized in Table 1.

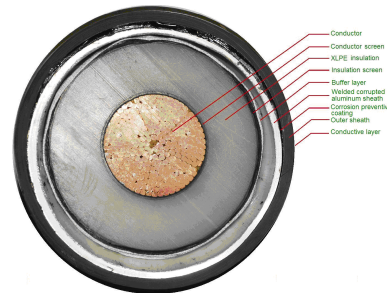


Fig. 1: A section of the test cable

Tab.1: Examination data of the cable configuration and material

No	Item	Dimensions
1	Conductor	2500 mm ²
2	Conductor screen	2.3 mm
3	Insulation	31.2 mm
4	Insulation screen	1.5 mm
5	Aluminum sheath	3.6 mm
6	Outer sheath	7.7 mm
7	Overall diameter	170.8 mm

Outdoor terminations

Type of porcelain outdoor termination: EBA (EVEA-06013); Manufacturer: VISCAS Corporation; Type and serial number of the connecting hardware: copper T₂, 529-1508. The suited porcelain bushing was