QUALIFICATION OF LONG 345 KV SUBMARINE XLPE CABLE SYSTEM

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ABSTRACT

This paper describes the outcome of a qualification programme comprising the design, manufacturing and testing of a 345 kV submarine XLPE cable system.

The XLPE cables were manufactured in three separate continuous lengths of about 11 km. Factory joints have not been introduced in the system. However, factory joints have for back-up reasons been developed for the EHV level. Additionally, special attention was given to the quality procedures for the manufacturing of these cables.

Each length was subjected to a routine test at 400 kV (23 kV/mm) using ac resonant frequency test equipment.

The whole submarine cable system, including cable and rigid repair joint, was type tested according to Electra 171 (mechanical tests) and IEC 62067 (electrical tests). Because similar cables and accessories already are pre-qualified at the 345 – 420 kV level, an EQ-test, according to TB303 from Cigré was considered appropriate for system qualification.

KEYWORDS

EHV, XLPE, submarine cable, type test, routine test, EQ test.

INTRODUCTION

During the last 5-10 years, the evolution of the XLPE technology for submarine cable applications has taken a big step towards higher voltages. Due to an increasing number of ac interconnections, offshore wind farms and oil&gas platforms, new cable connections have to be built. For long cable connections HVDC technology is most often the best alternative. However, for cable connections up to around 100 km, HVAC or even EHVAC cable connections may be the most beneficial solution.

Up to date there are only a few projects either already performed or just recently decided to be executed, at the 245 – 420 kV level. No cable connection has reached a length exceeding 10 km, at these voltage levels. So far, one short cable connection has been installed at the 420 kV level [1]. All other submarine cable projects have been designed for the 245 kV level or lower.

The 345 kV submarine cable system presented herein is the longest EHV ac link so far. The link, which has a route length of approximately 11 km, will be installed during the summer season of 2011.

The paper will address the design, manufacturing and testing of this cable system and a second paper will later describe the installation and operation of the link.

PROJECT DESCRIPTION

New York City experiences a steadily increasing demand for electrical power. The client, BEC (Bayonne Energy Center), has decided to construct a new natural gas fired 512 MW power generation facility to cut peak load demands. In the heavily congested New York City it was not possible to find a suitable site for the power plant. Across the Upper New York Bay in the city of Bayonne, New Jersey, the client was in possession of an ideal site on an abandoned industrial area. Later on it was decided to build the power plant on this site and connect it to the New York City transmission network through a submarine power cable system. The chosen connection point in New York was the Gowanus Substation in Brooklyn, owned by ConEdison. The cable route stretches from Bayonne, then making a northbound turn along the federal channel. Not far away from the Liberty Island and the world famous Statue of Liberty, the route crosses the federal channel and then it turns south again and finally reaches Gowanus in Brooklyn.

Figure 1. Overview of the 345 kV submarine cable route.

The route length is approximately 11 km and the water depth is limited to some 20 m. The submarine cable system comprises three single core cables spaced 10 m apart. Due to the heavily trafficked waters and the risk for anchor damages, the client required the submarine cables to be buried 4.6 m (15 feet) down in the seabed. Another specific client requirement was that no factory joints for the cables were allowed.