A.7.6.

Energy transmission on long three core/three foil XLPE power cables

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The limit in length for power transmission on three core XLPE submarine cables and single core XLPE cables laid in three-foil formation has been investigated. There are an increasing number of projects where power transmission from offshore power generation or power supply to offshore consumers is considered. Most of these transmission links have lengths between 20 and 150 km.

One mode of transmitting the power is by AC three core submarine cables. Acquiring right of ways for overhead lines on land, is costly, time consuming or nearly impossible in densely populated areas. One alternative energy transmission mode is by AC single core cables laid in three-foil formation. The long length transmission properties of three core cables and single core cables laid in close three-foil formation is similar and can be evaluated together.

A definition of "long" cables and their properties are attempted, based on the cables response to transient voltages. Based on the modern XLPE insulation system, the possibility of energy transmission over relatively long distances is explored.

The criteria for defining the power transmission limit have been the thermal capacity of the cable and a maximum voltage variation of ±10% between full load and no load. The compensation scheme is based on that half of the charging current is compensated at each end at full load.

Because of the length, the cables have been modelled with distributed parameters and the calculations have been limited to cables with rated voltage between 72 and 525 kV.

The following diagram is an example of the correlation between transmitted power and route length for three core submarine cables.

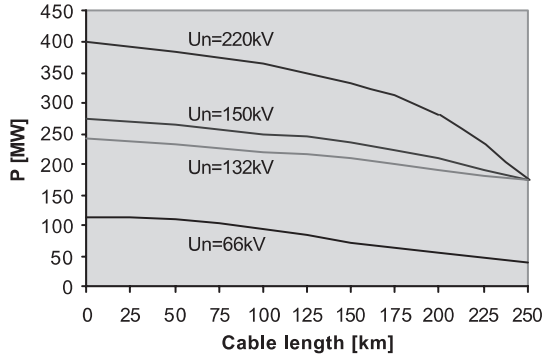

Fig. Limit of power flow as a function of length for different voltages 3x1x1000 mm^2

The transient load changes and the influence of the feeding network properties have also been studied, although not exhaustively.