

**B8.6****Optimising high voltage underground cable links**

LE PEURIAN S., EDF DER, Moret sur Loing, France

JUNG M., EDF Production Transport, Courbevoie, France

Résumé

De nombreux efforts ont été entrepris par EDF afin de réduire les coûts des liaisons souterraines H.T. Depuis le début des années 1990, une nouvelle génération de câbles 90 kV a été étudiée en associant trois constructeurs. Une réduction de l'épaisseur d'isolant et le remplacement de l'écran en plomb par un feuillard d'aluminium sont de nature à contribuer à ces efforts. Des techniques de pose innovantes comme la pose mécanisée ou le forage dirigé diminuent l'impact sur l'environnement lors de la mise en oeuvre, augmentent ainsi l'acceptation par la population et diminuent les coûts. Une nouvelle politique d'exploitation et de dimensionnement des câbles souterrains conduit à une meilleure exploitation et permet dans certain cas, notamment pour les liaisons raccordées à une ligne aérienne, de réduire leur section.

Due to the ever increasing concern by the population for the respect of the landscape, the construction of overhead lines is becoming more and more difficult. Underground lines, although more easily accepted are handicapped by higher costs. For economic reasons they are proposed as a partial solution on certain sections of the link. Therefore, underground cables are often laid to protect certain sites between two sections of overhead lines. Several efforts made by EDF to reduce the costs of underground links result in new cable technologies, a revised calculation and operating policy and an optimisation of laying techniques.

NEW CABLES FOR THE 90 KV NETWORK

EDF uses synthetic PE extruded high voltage cables since 1964 for the 63 kV network (1968 for 90 kV, 1969 for 225 kV and 1986 for 400 kV). Since the end of 1998 only XLPE insulated cables have been installed on all voltage levels. The PE insulation is no longer used for new links.

Abstract

Numerous efforts have been made by EDF to reduce the costs of H.V. Cable Links. Since the early 1990s, a new 90 kV cable generation has been developed in association with three cable manufacturers. A reduction of the insulation thickness and the use of an aluminium sheath instead of lead alloy contribute to these efforts. New innovative laying techniques like mechanical laying and horizontal drilling reduce the environmental impact during installation, increase the acceptance by the population and reduce the costs. A new calculation and operating policy leads to a better operating of the Underground Lines. In certain configurations, especially for links connected to overhead lines, this new policy may decrease significantly the conductor cross section.

Old 63 kV and 90 kV cables

The insulation thickness of the cables that have been laid until the end of 1998, is based on the maximum electric stress, mentioned in the EDF standards (6 kV/mm on the conductor screen and 3 kV/mm on the insulation screen).

The metallic shield which has to be designed to withstand the maximum single phase short circuit constraints of the network (8 kA / 1.7 s for 63 kV and 10.3 kA / 1.7 s for 90 kV) is generally made of a lead alloy smooth sheath.

Up to now, this technology is proved to be very reliable, most of the cable faults having external origins.

A new generation of 90 kV cables

EDF is committed to increase the number of underground links integrated in overhead lines for the high voltage network (63 and 90 kV). Therefore, in the early 1990s, EDF associated to three cable manufacturers, launched a research program in order to develop a new cable generation inspired by the 20 kV cables that are installed on the distribution