TRANSITION JOINTS

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ABSTRACT

This article clarifies RTE (the French Electricity Transmission System Operator) and EDF R&D works on optimization concerns for future underground links and on adjustment of existing network necessities.

The working group concludes with the definition of a specific method to qualify transition joints allowing connection between dissimilar cables.

The use of these transition joints offers a reliable answer for the requirements of the French Grid.

KEYWORDS

Joints.

INTRODUCTION

Nowadays, RTE gets for each underground line the whole cable system (cables and accessories) from a single manufacturer. The same manufacturer is required for the system assembly.

In order to guarantee the best reliability, RTE qualifies all equipments before their installation on the network. The qualification process concerns the whole system: cable and accessories are approved as a package. This process guaranties the compatibility among the tested cables and accessories. It is adapted for the installation of lines which are homogeneous all along their route.

RTE intention is to keep optimizing new underground lines. Indeed, an underground current rate mainly relies on its thermal environment. The route link doesn't usually offer an homogeneous environment. For example, an obstacle often has to be avoided by using great depth drilling installation. This special route point will oblige the use of high section cables, while the rest of the route only needs smaller section cables. Therefore, in order to decrease the lump sum of the line, the connection between dissimilar cable sections would be an interesting solution.

Furthermore, RTE has to realize more and more operations on existing lines :

- Partial cable changes, to renew the network and to answer costumer requests,
- Extension of the existing underground network.

Cables and accessories used for these 'old' lines are not manufactured or available any more when the change of the whole underground line cannot be taken into consideration. That is why a connection between two different cable generations has to be validated.

Then, RTE and EDF R&D started a combined reflection to find solutions to both objectives – connection between cables with different sections and connection between old generation cables and new ones – with the same reliability as connection between identical cables.

Paper insulated cables maintained by RTE are old and are to be replaced following the development on the network. The group decided to limit the scope of their study on XLPE insulated cables only. About 3000 km are involved, the oldest ones were installed around forty years ago.

METHODOLOGY

RTE wishes to dispose of the necessary transition equipments to fulfil these new necessities. In order not to degrade the grid's conditions of operation, the reliability of transition joints between two different types of cable should be the same as usual joints. The traditional approach would have been "one need of transition joint = one test". Though, it is not conceivable to achieve the whole qualification process for each and every existing cable combination: costs and achievement delays would have been too important.

EDF R&D established a new process, based on the characterisation of determining parameters and the associated risk analysis. This process gives parameters to support decision for different cables linking feasibility.

Aim:

« MERPILS HTB »: Méthodologie Et Recommandations Pour l'Interchangeabilité des Lignes Souterraines HTB (Methodology and Recommendations for the Interchangeability of HV underground lines) is a process to optimize qualification costs and delays. It gives qualification extension rules by sections, but also qualification extension rules between different manufacturers and/or existing techniques. At last, it can reduce the number of tests and puts forward essential credibility data in order to assess the equipment on file.

Methodology:

With the knowledge of cables and joints characteristics, the process goes through seven analysis steps that help to deduce the possibilities to connect the two cables concerned with the studied transition joint. The two cables can have dissimilar constructions and/or can come from different manufacturers. These seven steps consist in :

- dimensional compatibility,
- validating that asymmetry has no wrong effect,
- dissimilar forms and adherence types of the external semi-conducting screen,
- dissimilar material type of the oversheath,