

## SPECIFICATION FOR EXTRUDED HVDC LAND CABLE SYSTEMS

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### ABSTRACT

The project of 320 kV HVDC underground link between France and Spain, whose main objectives are the reinforcement of the Europe Community grid and the valorisation of renewable energies, is a world first. Neither DC link using XLPE cables nor VSC technology for converter stations have been commercially achieved at this voltage level.

Therefore INELFE, the corporate structure hold by both REE (Red Electrica de España) and RTE (Réseau de Transport d'Electricité), has established a specification for extruded HVDC cable systems, considering international recommendations, TSO experience and fulfilling the requirements of the project, in order to review all these issues.

### KEYWORDS

INELFE, France-Spain, HVDC, 320 kV, extruded cable, qualification tests, CIGRE TB 219, ageing simulation process, VSC converter.

### INTRODUCTION

The project of interconnecting France and Spain via an underground link before mid of year 2014 is recognized as a European with high stake matter. Actually, this underground link, whose aim is to transmit 2000 MW, is 65 km long, including 8.6 km of dedicated gallery throughout the Pyrenees mountains. With regards to this huge length and the needs of the project, INELFE (Interconnexion Electrique entre la France et l'Espagne), the corporate structure hold at 50% by REE (Red Electrica de España) and at 50% by RTE (Réseau de Transport d'Electricité), has chosen to install 320 kV 2-bipole extruded HVDC cables. In these conditions, the only existing cable fulfilling all the requirements is the 2500 mm<sup>2</sup> Copper cable.



Fig. 1: France-Spain HVDC underground link route

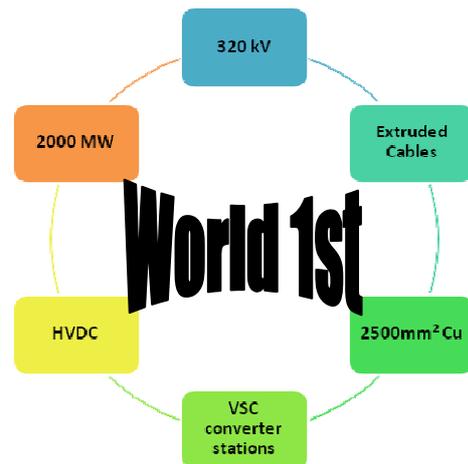


Fig. 2: list of conditions making the France-Spain project a world 1st in terms of cable system to be qualified

Until today, no cable system has been carried out according to a test programme that considers all the conditions of the project. Therefore, INELFE has decided to make an electrical and thermomechanical accelerated ageing of the DC cable system via a dedicated tests program, covering all the stresses and as much as possible being in accordance with the international recommendations from the CIGRE Technical Brochure 219 [1].

The following paragraphs show in detail the assumptions of INELFE in order to build the tests programme, and what are the changes featuring this dedicated specification in comparison with programmes recommended by CIGRE or IEC standards [2-3].

### REASONS WHY EXISTING STANDARDS AND RECOMMENDATIONS HAVE TO BE ADAPTED TO INELFE PROJECT

The conditions for carrying out the tests programme that are unchangeable are these listed in Fig. 2 and the timeframe of the project is imposed by the European Union. It means that INELFE specification shall qualify a 320 kV extruded HVDC cable system via a programme that must be less than 1 year long. Regarding these conditions, the standards and international recommendations can't be fully applied for this project.