

## RED ELECTRICA'S OPERATING EXPERIENCE ON 400KV INTERCONNECTION SPAIN-MOROCCO.

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### ABSTRACT

After 14 years since the installation of the first high voltage interconnection between Spain and Morocco, this paper presents the most important working experiences.

Planned maintenance actions to guarantee a continued efficient performance of underground and submarine cables will be presented. Three submarine inspections with remote a operation vehicle have been carried out. The results of inspections and tests to assess the estate of submarine and underground cables' insulation will be shown.

Summarizing, this paper includes a complete review of the behaviour of this Interconnection between two continents over the last fourteen years since the installation, including better practices, maintenance and methodology for repairing damages.

### KEYWORDS

Diver Survey; ROV Survey (Remote Operating Vehicle); sea-land joints; filling compound; outer sheath test; low sheath resistance.

### INTRODUCTION

Red Eléctric (REE) is the Spanish TSO company. As well as being the owner of 36.000 km of lines, it is also the System Operator and the Manager of the Transport Grid.

The electric interconnection 400 kV between Spain and Morocco represents one the maximum exponents of the cooperation policy between Europe and the countries of the South Mediterranean Sea and is supported by the European Community. The electrical infrastructure establishes a bond which reinforces the cooperation between both countries in terms of energy cooperation, a very important issue in the socioeconomic development of any country. This interconnection represents a step in the development of the electric infrastructures in Morocco and contributes to the stability of the frequency and voltage of the Moroccan network. Moreover, it improves generation and transport operation systems of both countries.

In Spain, REE is the company responsible for the electric interconnection between Spain and Morocco, which was initiated in 1997 with the first interconnection and finished in 2006 with the Second one. There are seven AC cables in total for both interconnections, as one cable is a reserve cable. It is the only submarine interconnection between Europe and the Magreb. The length of it is 26 km approximately and an exchange of 700 MW in each interconnection.

REE and Office Nationale d'Electricité de Maroc (ONE) are each 50% owners of the submarine Interconnection.

On the Spanish coast, there is an underground part of about 2, 5 km between Tarifa and the sea-land joints. This underground part is owned by REE.



Fig.1: route of the 400 kV Spain-Morocco Interconnection.

This paper presents the most relevant working experiences of the interconnection between Spain and Morocco. The information deals with a variety of important issues: diagnostic methods, environmental considerations, methodologies of repair, etc.

### PLANNED MAINTENANCE ACTIONS.

There are some activities concerning the submarine and underground cables which are planned for either every year or several years.

#### Submarine cables

In 1.997 a Committee was created composed of a group of members from REE and ONE. The aim of it is to establish maintenance strategies, making decisions and preparing all the documentation. An Emergency Committee was also created with the purpose of the coordination of necessary activities in the case of a failure in the submarine installation.

#### **Activities coordination between REE and ONE.**

According to what is said in the previous paragraph, the Maintenance Committee prepared a document called 'Coordination Procedure', in order to have a written document, where not only this coordination for the repair of a failure is specified, but also the contacts of people needed and the main actions to be taken from REE and ONE. This document has to be updated every year.

There is also a contract with an external company, for assistance and management services in case of a failure and localisation of it. This company have to be available