



JICABLE'07

Rapporteur's Session Report

A.2 SESSION : HV / EHV LARGE PROJECTS

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Session A.2 was dedicated to HV/EHV large projects. Six presentations were made during this session.

In the first morning session A.1, presentations about HV/EHV cable systems developments referred to testing according to IEC 62067. This standard has now been the basis of specifications for main projects world-wide. As a link between sessions A.1 and A.2, presentation A.2.1 introduced the work of CIGRE WG B1-06. Based on the experience of several EHV cable projects, B1-06 produced recommendations for the "Revision of Qualification procedures for HV/EHV AC extruded cable systems", (Cigre Technical Brochure 303 issued in August 2006) with the goal to reduce time to market for innovative solutions. A new test called "Extension of Qualification Test" is proposed. This is seen by the European manufacturers as a great step forward.

The first detailed description of the St Johns Wood to Elstree 400 kV cable system in London was given in presentation A.2.2 with three main topics :

- information on the project in general : opened in 1997, the project was completed in summer 2005. Special attention should be given to the cross-bonding concept (continuous cross-bonding) coming from the fact that no system earth is provided in the 20 km tunnel where the cable system is installed.
- challenges on testing equipments (PD sensors and PD measurement system, HV resonant testing equipment using three reactors)
- on site-testing results with the combination of resonant AC voltage testing with distributed synchronous measurement at all cable accessories.

A.2.3 reported on the first long distance 345 kV extruded cable in the US. The history of the project was briefly recalled and the main points were outlined :

- integration of the cable in the system : cable impedance and susceptance are very important for system analysis and protective system design
- vault testing : a special tether restraint system was designed and tested for increased safety in case of short-circuit in the manholes
- environmental management : sampling and water analysis were performed to characterize construction dewatering wastewater

- after laying tests : AC resonant testing and PD measurements were carried out
- measurement of the ampacity on the complete cable system as built : an ampacity verification was performed at the hottest time of the year.

A.2.4 presented a very long XLPE 150 kV underground cable system in Belgium. This was a turn-key project, carried out by a joint team of a civil works company and a cable system supplier. The 2000 mm² aluminium cable was laid in trefoil configuration, with the use of thermal backfill. The cable system was cross-bonded, without SVL. Main challenge was the after laying testing of the cable system which was performed at 2 U₀. In order to reduce the load for the testing equipment, the cable was divided in three parts and the tests were made in three steps, requiring the use of temporary accessories (water terminations and blind joints).

A.2.5 introduced the new project of undergrounding and reorganization of the electrical system by Iberdrola in Madrid. Known as "Plan Madrid", the project comprises three main parts :

- Construction of 16 GIS Substations
 - Dismantling of 125 km of overhead lines
 - Undergrounding of more than 180 km of circuits at 225, 132, 66 and 45 kV
- All project features were explained such as planning (including environmental impact assessment), design (cable system, electromagnetic field management), construction (new joint bays, use of multi-purposes tunnels) and project management involving various teams in the Company. As the result, the project complies with ISO 9001/2000, ISO 14001/2004 and OHSAS 18001/1999 and will greatly improve the Environmental impact on the City.

A.2.6 paid attention to the installation of cables in multi-purposes tunnels.

Main advantages of this solution were recalled : efficient use of the soil, easy accessibility, adequate protection against external damage. Main drawbacks were also listed : mutual impact between systems, complex organizational structure and high costs.

Careful risk analysis must be carried out before installation of a HV cable in a multi-purpose tunnel for each of the

Return to Session

following situations : installation, operation, failure.

Main technical issues related to HV cable were inventoried : heat generation, magnetic field, induced voltages and failure behaviour.

It was recalled that a Cigre Working Group was preparing guidelines for proper coexistence between the different parties.

This concept of multi-purpose tunnel is considered to be gaining in attractivity.

From the floor, questions were asked regarding EMF (preferred laying configurations), presence of joints in a multi-purpose tunnels (and risks attached) and guaranteed transmission capacity of cable systems (who takes this responsibility?).