WETS'07 - Rapporteur's Report

AFTERNOON SESSIONS :

Chairman : Juan Prieto Monterrubio, REE, Spain
Rapporteur : Christian Remy, Prysmian, France

Summary of the Afternoon Sessions

SESSION N°3

Topic 3 – Long length links in the world: Operating conditions and results

• Mr Nozaki (Japan) presented some operating issues associated with the insertion of shunt reactors (SR) in long UG links: necessity to review the switching procedures of circuit breakers (CB) because of the delayed passage to zero of line currents, necessity to install surge arresters and CB open timing controllers for counteracting restrikes after SR openings. Surge arresters are also used for damping series resonances which could occur.

• Pr Swingler (UK) presented a major EHV cable tunnel project in London (Elstree to St John's Wood). A single circuit of 2500 mm² Cu 400 kV XLPE cable, with DTS monitoring and PD couplers on accessories, is installed in this forced air cooled tunnel. Reasons for recurring to a tunnel in this highly urbanised area have been explained. As the issues linked to the construction of shafts and substations: site access, traffic, consultations and authorisations, relationship with local communities. A discussion followed about DTS measurements sensitivity, PD measurements in operation, overvoltages and possible causes for fire.

• A first paper by Mr Wiechowski (Denmark) compared measurements and computer simulations of switching surge occurring during disconnection of 400 kV UGC/OHL with shunt reactors. They are fairly matching in terms of resonance frequencies and overvoltages even if damping losses are underestimated in the model. Some improvements of the transmission system are proposed.

• The second presentation by Mr Wiechowski was about a study worked out at planning stage for a future 106 km long 400 kV AC cable line in Denmark. This study addresses issues related to power flows through the network, reactive power compensation (magnitude and location), harmonic impedances (possible resonances) and transients phenomena (line energisation, disconnection, reclosures, etc…). Difficulties arising from the lack of data for modelling cable line at frequencies higher than 50/60 Hz have been highlighted. A discussion followed about cable design (insulation material choice for improving capacitance, oversizing of the insulation wall thickness (because of overvoltages levels) and availability of data for HF modelling of cable.

• Mr Courset (France) presented the French maintenance policy for UG lines, in terms of periodical inspections of cable routes, checks of equipments performances and conditions, and re-rating after changes in thermal environment of cables. Another important pillar of this policy is the use of an asset management tool for analysing the "in service experience". A short discussion about use of cathodic protection for extruded cables (very rarely applied, indeed) and availability of statistical data provided by the asset management tool.

Topic 4 – Long length links in the world: Economical performances and environmental aspects

• Mrs Roinel (France) spoke about the environmental study carried out for a 20 km long HV cable line, located in a 100% rural area, in Brittany. Beyond the introduction of technical innovations (cable lengths of about 3 km, pushing/floating laying method) the project has been the opportunity for improving the environmental knowledge of RTE, the French TSO, either at the working stage or at the recovering stage of the line construction. The experience made allows defining guidelines for conducting such projects from an environmental perspective. The following discussion was about land use after works, issues related to soil replacement (topsoil, seeds and foreign species…), thermal criteria and the choice of UGC against OHL.

• Pr Swingler (UK) referred about the environmental problems encountered during the construction of a large UG 400 kV cable line in the North Yorkshire. Though a process lasting ten years several issues had to be solved: location of the 6 m long cable portion within the whole 75 km long project (mainly OHL), containment of the DDB of the Fluid Filled cables, directional drilling for preserving hedgerows, civil works and installation in a BSE disease context, delays caused by discovery of archaeological remains and topsoil reinstatement. According to the following exchanges no particular issues with leaks of the FF cables have been reported.

SESSION N°4

Topic 5 – Evolution of the technical and economical performances

• Mrs Chauvancy (France) highlighted the advantages of extruded cables with a smooth aluminium sheath. The technology, introduced in the French grid in 1998, is now mandatory for HV cables (from 2005) and EHV cables (from 2006). Reduced weight and bending radii are allowing longer transportable lengths of cables, use of fewer joint and joint bays and enabling the mechanical laying of HV cables. Combined with the properties of XLPE (maintenance free and lower dielectric losses) these cables feature lower cost and higher reliability. It has been clarified in the following discussion that short circuit currents level is driving the design of the Al thickness and that no additional Al wires are requested. Concern about the behaviour in slopes when theses cables are laid in plastic ducts has been raised. It has been answered that these cables are never buried direct but always laid in plastic ducts, that there are limits for the slope ratio, a special clamping can be used and that directional drilling can also be envisaged where necessary.

• Mr Courset (France) reported about the development of transition joints between dissimilar cables in term of conductor CSA, extruded insulation and metallic sheath. These joints will be used on new links (and existing links for the replaced sections) for reducing the economics if the lines through a better fitting of conductor CSA to local environmental constraints on each section of the link. New qualification procedures and testing area have been set up for this technology. A question arose about the maximum CSA difference allowed by the new joints. There is no limit but attention has to be paid to thermomechanical behaviour during cyclic loading. Virtually, as such technology is used for solving issues of hot spots along the cable route, no large CSA differences are experienced.
Mr F. Rüter reminded everybody that Cigré is setting up a Working Group on the qualification of transition joints.

• Mr Saugrain (France) made a point on the latest developments of long High Temperature Superconducting (HTS) cables. Currently three major HTS AC cables are in operation (in the USA) according to the 3 possible configurations: concentric phases (triaxial design), three phases in one common envelope or three separate phases. The LIPA Project (574 MVA) with its 600 m, is the longest HTS transmission system in the world. Other possible HTS projects have been evoked: a 6 km HTS AC cable at 50 kV and a 10 km HTS AC cable at 138 kV. The use for DC transmission is also possible for lengths up to 20 kms. Concern arose about the grid reliability when HTS cables are inserted within. It has been answered that this technology is aiming at niche markets, at distribution level not at wider application. It is also too early for stating any repairing time for such cables.

• Mr Balog (Norway) showed an estimation of maximum transmission length of submarine AC cables (~100 km at 400 kV level, ~200 km at 230 kV level) and the next steps necessary for assessing the technology of HVAC XLPE and HVDC extruded submarine cables.

Topic 6 – Prospect of development in the world of new long length HV links by insulated power cables.

• Last but not least Mrs Roinel (France) developed this topic in the case of the French grid where it will be necessary to connect new generation capacities with an evermore growing energy demand in a general context of societal reluctance to new electrical links and increasing environmental hindrances. It has been illustrated with an example of a new UG line in the vicinity of Paris. The main technical difficulties are crossing, inside long horizontal drillings, a railway and the Seine River (three times) and passing through a protected forest and encountering rocky ground.

Mr Monterrubio summed up the afternoon session.

Mr Bolza made the final conclusion and closed the workshop.

Christian Remy - (Prysmian France)
Rapporteur of sessions 3 & 4