CIGRE Study Committee B1

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP[1]

WG N° B1.62	**Name of Convenor:** Stefano Franchi Bononi (ITALY) **E-mail address**: stefano.franchibononi@prysmiangroup.com
Strategic Directions #[2]: 1, 2	**Technical Issues #[3]: 3, 10**
The WG applies to distribution networks[4]: No	
Potential Benefit of WG work #[6]: 2, 3, 5	
Title of the Group: Recommendations for testing DC extruded cable systems for power transmission at a rated voltage up to and including 800 kV	

Scope, deliverables and proposed time schedule of the Group:

Background:

The increased demand in recent years for bulk transmission of electrical power over long distances has fostered the fast and successful development of extruded insulation technologies for HVDC Transmission Systems at increasing current and voltage levels; in fact, both traditional and newer technologies are evolving. Extruded 320 kV DC cable systems have been developed, qualified and installed in numerous cases and further increases in voltage levels and conductor sizes being developed. The majority of the HVDC extruded systems qualified and installed today are based on XLPE technology. However other extruded technologies, using either un-cross-linked or partially cross-linked materials, have been introduced and in some case installed and new technical guidelines are required to take account of all the different technologies.

A further technological milestone in the field of extruded dielectrics has been reached with the demonstration of their feasibility for voltages well in excess of 500kV using the test procedures recommended in CIGRE Technical Brochure 496 (2012). Whilst scope of TB 496 is limited to 500kV, which was the foreseen need in 2012, the principles contained within it have already been successfully applied to higher voltages.

In the field of laminated insulation cable systems, recent progress indicates the availability of PPL and Mass Impregnated paper insulated HVDC cable systems for greater than 500kV. These systems are generally tested according to the Technical Report published in Electra 189 (April 2000) and a following Addendum (Electra 218, Feb 2005), covering rated voltages up to 800 kV.

In this scenario it is relevant that CIGRE also develops clear guidelines for the specification of extruded cable systems dedicated to voltage higher than 500 kV.

As the new guidelines for extruded cable systems could change some test methods (e.g.: impulse superimposed onto HVDC) SC B1 decided to launch in parallel a WG for laminated cable systems to introduce the same methods, if appropriate, and revise ELECTRA 189 if needed. In this way same tests specified in different guidelines will have same test methods.

The resulting recommendations should help manufacturers, installers and users to design, test and operate the whole cable system.

Scope:

Solid insulated cable systems for the voltage class up to, and including, 800 kV.

WG will cover:

1. Review of Test loop heating (see TB 496 1.5.5)
2. Definition of Rated and Max Voltage
3. Review of Superimposed impulses test (TB 496: chapters 3.5 and 4.4.3)
4. Definition of Transient phenomena for HVDC cables in case of fault (Temporary Over Voltage)
5. Definition of voltage levels for Type, Prequalification (PQ) and Commissioning Tests, avoiding unnecessarily high test voltage
6. Review of PQ test sequence (TB 496 chapter 3.4)
7. Review of Routine Tests (TB 496 Chapter 5)
8. Review of Sample Tests (TB 496 Chapter 6)
9. Assessment whether TB 303 is enough to define what means "significant change" in a cable system, in order to know when a PQ/Type Test has to be performed.
10. Definition of an extension of qualification test shorter than PQ for peculiar application

The WG may benefit from collaboration with JWG B4/C1.65 and JWG B4/B1/C4.73.

Deliverables:

☒ Technical Brochure and Executive summary in Electra

☐ Electra report

☒ Tutorial[5]

Time Schedule: start: February 2018 **Final Report**: February 2021

Approval by Technical Committee Chairman:

Date: 23/02/2018

Notes: [1] or Joint Working Group (JWG), [2] See attached Table 2, [3]See attached Table 1, [4] Delete as appropriate, [5] Presentation of the work done by the WG, [6] See attached table 3

Table 1: Technical Issues of the TC project "Network of the Future" (cf. Electra 256 June 2011)

1	Active Distribution Networks resulting in bidirectional flows
2	The application of advanced metering and resulting massive need for exchange of information.
3	The growth in the application of HVDC and power electronics at all voltage levels and its impact on power quality, system control, and system security, and standardisation.
4	The need for the development and massive installation of energy storage systems, and the impact this can have on the power system development and operation.
5	New concepts for system operation and control to take account of active customer interactions and different generation types.
6	New concepts for protection to respond to the developing grid and different characteristics of generation.
7	New concepts in planning to take into account increasing environmental constraints, and new technology solutions for active and reactive power flow control.
8	New tools for system technical performance assessment, because of new Customer, Generator and Network characteristics.
9	Increase of right of way capacity and use of overhead, underground and subsea infrastructure, and its consequence on the technical performance and reliability of the network.
10	An increasing need for keeping Stakeholders aware of the technical and commercial consequences and keeping them engaged during the development of the network of the future.

Table 2: Strategic directions of the TC (ref. Electra 249 April 2010)

1	The electrical power system of the future
2	Making the best use of the existing system
3	Focus on the environment and sustainability
4	Preparation of material readable for non-technical audience

Table 3: Potential benefit of work

1	Commercial, business or economic benefit for industry or the community can be identified as a direct result of this work
2	Existing or future high interest in the work from a wide range of stakeholders
3	Work is likely to contribute to new or revised industry standards or with other long term interest for the Electric Power Industry
4	State-of-the-art or innovative solutions or new technical direction
5	Guide or survey related to existing techniques. Or an update on past work or previous Technical Brochures
6	Work likely to have a safety or environmental benefit