CIGRE Study committe B1

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG B1.101

NAME OF THE CONVENOR
Bruzek Christian-Eric (ITALY)

TITLE
Recommendations for testing of DC Superconducting Cable Systems

THE WG APPLIES TO DISTRIBUTION NETWORKS: NO

ENERGY TRANSITION
4 / Sustainability and Climate Change
5 / Grids and Flexibility

POTENTIAL BENEFIT OF WG WORK
3 / likely to contribute to new or revised industry standards
4 / state-of-the-art or innovative solutions or directions

STRATEGIC DIRECTION
1 / The electrical power system of the future reinforcing the End-to-End nature of CIGRE: respond to speed of changes in the industry by preparing and disseminating state-ofthe-art technological advances

SUSTAINABLE DEVELOPMENT GOAL
7 / Affordable and clean energy
9 / Industry, innovation and infrastructure

BACKGROUND :

Superconducting DC cables systems have unique features such as the ability to transmit huge power without Joule losses.

The energy transition will require large bulk transmission of electrical energy. Superconducting cables will be able to deliver this.

PURPOSE / OBJECTIVE / BENEFIT OF THIS WORK :

There is presently no international agreement on the tests and scope of tests to validate their design.

Test recommendations are therefore needed to allign the technical development. It will follow the lines of TB 538. Recommendations on common test procedures such as type tests, factory tests and commissioning tests are required for safe and reliable deployment of this new technology in future electrical networks. To support the world-wide deployment of the superconducting DC cable system and to have common and accepted references for testing, we believe it is worthwhile to create a CIGRE working group in connection with IEC TC90 and TC20.

The users will be Transmission System Operators. The cable manufacturers will deliver and install the cable system. Material suppliers will include stainless steel, insulating papers and polymers, liquid nitrogen providers. Civil works will be needed for the installation.

The energy transition is at the core of this NWI as DC Superconducting Cable Systems have the ability to transmit power without electric resistance:

- No voltage drop
- No joule effect
- Reduced electric power transmission losses.

SCOPE :

Scope of the working group includes DC cable design with High Temperature Superconductors (HTS) and MgB2 superconductors down to an operating temperature of 20 K. It excludes cables with Low Temperature Superconductors (LTS) with operating temperature below 20 K.

Voltage range: up to 800 kV DC (to align with TB 852 and TB 853).

Cryogenic cooling hardware is outside the scope. However, performance specification, reliability as well as functional requirements should be addressed.

The working group shall collect detailed experience from existing superconducting cable projects in DC.

The working group shall address superconducting cable systems: installed cable, joints and terminations.

The guideline shall include considerations for all known superconducting cable design options including single poles in separated cryogenic envelops, several poles in a single cryostat envelope, and concentric poles (single cable) in a single cryostat.

The guideline shall address those test requirements associated with design and operation of a pressurized piping and pressure vessel system as applicable to superconducting cable systems

The working group shall recommend testing requirements and guidelines for DC superconducting cable system in the following areas:

- Type / qualification tests
- Factory tests
- After installation tests

These requirements should be setup on the basis of technical brochure TB852 (HVDC test requirement for standard HVDC systems), technical brochure TB538 (recommendations for testing superconducting cables) and related IEC standard (IEC 62895 and IEC 63075 respectively).

The WG shall liason with D1.69 "Guidelines for test techniques of High Temperature Superconducing (HTS) sysems.

The working group should investigate the interest of performing a pre-qualification test, as defined for standard HVDC cable system, and provide requirements for such test if such interest is confirmed.

DELIVERABLES AND EVENTS

Deliverables Types

Annual progress and activity report to Study Committee
Technical Brochure and Executive Summary in Electra
Tutorial
Webinar

Time schedule

Q4	2025	Recruit members
Q1	2026	Develop workplan
Q4	2027	Draft TB for SC review
Q4	2028	Final TB for publication
Q4	2028	Approved Tutorial

APPROVAL BY TECHNICAL COUNCIL CHAIRMAN:

Rannvegi S. J. Loken
November 24th, 2025