



**Study Committee No : B3 / B1**

**WORKING BODY FORM**

**Group No : JWG B3/B1.27**

**Name of Convener : Hermann KOCH (DE)**  
[hermann.koch@siemens.com](mailto:hermann.koch@siemens.com)

**TITLE of the Group : Factors for investment decision GIL vs. Cables for AC Transmission**

Cables and GIL lines are both solutions for undergrounding transmission lines.  
Several Cigre TB have been published to address the issues regarding both technologies:

- TB 110 "Comparison cables/OHL"
- TB 194 "Construction of cables", 2001
- TB 250 from B1 "technical and environmental issues regarding the integration of a new HV Cable System in the Network". Hundreds of circuit kilometres of cables have been installed at EHV (345 kV, 400 kV and 500 kV) voltages since 1997.
- TB 218 "Gas Insulated Transmission Lines (GIL)" (JWG 23/21/33.15)
- TB 351 "Application of Long High Capacity Gas Insulated Lines in Structures" (JWG B3/B1.09)
- TB 403 "Shared structures and cables", 2010

Utilities are often asking for recommendations regarding underground solutions of undergrounding and for investment decision between GIL or Extruded Land Cables (AC) .

To establish unbiased recommendations, such work needs to be carried out by members of both SCB1 "Extruded Cables" and SCB3 "Substations - GIL."

Goals

The goal of the new work shall identify factors and drivers for recommendations fields of application.

The work can only identify cost factors and cost drivers but no absolute figures.

Introduction

In most cases an underground solution is an alternative to an OHL, and the choice between cable and GIL will be made in a second step.

General

The capacity of a single circuit could be higher when using GIL than in case of a single cable circuit. The application of long cables and GIL may affect the network layout. Also parallel connection of OHL/cables/GIL will influence the network solution. General statements on handling such questions will be reminded.

Scope of Work

To define the factors for investment decision GIL vs. Cables.

### Terms of References

The joint working group shall:

- collect data of existing underground sections transmission lines for bulk power
- give information about future applications
- define the specific factors for the cost comparison
- define steady state and temporary overload conditions for power transmission
- define impact laying option (e.g. tunnel, buried)

For this comparison:

- economic parameters of cable and GIL installations will be identified and the relative cost structure will be given
- typical transmission solutions of GIL and cables will be compared
- environmental impact such as health and safety requirements and external electromagnetic fields will be taken into account
- technical definitions of cost factors and cost drivers will be given to make the solutions comparable, e.g. access and width of route, system configuration, right of way, safety aspects, case of fire, transmission losses, reactive power compensation, ageing of equipment, life cycle cost, service experiences, gas tightness, recycling of material at the end of life, CO<sub>2</sub> emission impact (production, installation, life time), waste disposal, geographical, construction, O&M, standards and regulations.
- practical applications will be described
- the impact of restoration cost factors in case of failure and relevant outage duration will be covered

The study shall be limited to:

- AC underground transmission
- Rated voltages 52 kV to 800 kV
- Extruded cables

### Deliverables

A technical brochure and tutorial to be published in 3 years after project starts.

Created: 01/2011

Duration: 3 years

### Members

Members from both SC B1 and B3.

Members from Utilities

**Approval by TC Chairman : Klaus Fröhlich**

**Date : 29/03/2011**