



WORKING GROUP FORM

Study Committee: B4

WG number: WG B4.52	Name of Convener: Gunnar Asplund (SE)
Title: HVDC Grid Feasibility Study	
Terms of Reference	
Background:	
<p>As part of the CIGRE “Network of the Future” initiative, B4 would like to look at the possibility of using HVDC transmission to create a DC Grid that could work together with the ac grid, to the benefit of Grid Operators, Generators and Consumers.</p> <p>The growth in renewable power generation and increases in power trade across national borders results in new load flow patterns, especially in mature networks, e.g. Europe and North America. The traditional solution to this problem would be an overlaying UHVAC grid. The experience of the last decades indicates that such a solution could be very time demanding regarding the permitting process, and in some cases it may even be impossible get permission to build new overhead lines.</p> <p>An HVDC net using existing ac overhead lines upgraded for higher transmission capacity using dc or with cables could offer an alternative with fewer problems regarding permits. To investigate whether this is technically feasible can be a suitable task for a CIGRE working group. Voltage Sourced Converter HVDC Transmission is well suited to HVDC grids as change of power direction does not require a change of polarity, as is required when using thyristor based Line Commutated Converter (LCC) HVDC technology. Nevertheless, solutions based on LCC HVDC and a mixture of the two technologies will also be investigated..</p>	
Scope	
<p>The proposed WG will undertake the following tasks:</p> <ul style="list-style-type: none">• For DC Grids the security and reliability of supply will be very important factors. Any fault on the DC Grid would be felt over a very long distance, since the inductance only provides temporary fault current limitation, the WG will examine ways to prevent the effect of fault at remote locations.• Costs will form an important role in determining the feasibility of DC Grids, and the working group will draw on work already done within CIGRE to identify the relative costs of ac and dc alternatives. Note that in some cases the only option for additional transmission capacity will involve cables.• The WG will look at various Grid configurations such as radial and meshed nets, from the viewpoint of reliability and controllability and finally look at a complete HVDC grid.• As a grid has more branches than nodes the methodology to achieve power flow control will be investigated.• Loss of a whole grid should in principle never happen. This puts requirements on the structure of the net with sufficient redundancy, need for sectionalisation of the net by HVDC breakers and protections for first, second and third zone. Whilst dc breakers and protections have yet to be developed, the WG can look at identifying the necessary breaking current capabilities and times.• Starting from the standard voltage levels used for AC networks, the WG will look at the possibility of recommending standard voltages for DC Grids.• The WG will discuss the aspects of the converter station design that may need to be standardised, such that stations from different manufacturers can be connected to a	

dc grid. The outcome of this may be recommendations for the ToR of future WGs.

Deliverables and time schedule:

Commencement of the WG early 2009. Technical brochure 2011.

Other SCs/ Target Groups concerned by the work:

Utility engineers, Asset owners, Consulting, Contracting companies, Manufacturers,
Regulatory authorities

Approval by Technical Committee Chairman: Klaus Fröhlich

Date : 20/01/2009