24, February 2010

STUDY COMMITTEE B2

Terms of reference of Working Group WG B2.41 : 2010 - 2013

Working Group title: Guide to the conversion of existing AC lines to DC operation	
Convener **:** **Jan Lunquist**	***Secretary :***

Needs of Target Groups: TAG Survey Oct 2009:

- Conversion of AC lines to DC
- Increased power flow on existing lines

Needs of Target Groups: SC B2 Srategic Plan, July 2009:

- Get greater power transfer out of existing lines
- Increased power transfer capability with HVDC, bipole or tripole

Terms of reference

Prepare Technical Brochure and organize a technical colloquium evaluating the possible conversion of existing AC lines to operation with DC. Impact of conversion on corona and field effects, insulation reliability, and maximum power flow will be considered. Also DC insulator selection, and current rating with regard to the safety clearance to ground. "Hybrid line" effects associated with DC conversion of one circuit of a double-circuit AC line, are treated as well. Overall (line-technology plus inverter technology) economic aspects resulting from ac-dc conversion investments are considered including increased overall system loadability. Most appropriate Tower-arrangements are described. Reference to case studies is added.

Background

The power transfer capacity of an existing AC transmission line may be increased by conversion to DC. The main difference between AC and DC is that stability constraints put an upper limit on the power capacity of long AC lines, while DC lines are can be operated up to the thermal limit of the line. Another reason is that the voltage withstand of the insulation is better utilized by the constant DC voltage compared to the time-varying AC voltage. Corona effects at high voltage levels are also less severe with DC compared with AC, which may allow a comparatively high DC voltage to be used.

Specific topics to be considered in WG:

• Environmental aspects - primarily corona and field effects (including space charges) - strongly dependent on the configuration of the line and limit the maximum DC voltage that can be applied.

• Insulation aspects - selection of appropriate replacement DC insulators (existing AC insulators may not be designed for DC operation) and calculation of overvoltage withstand of the line and impact on lightning performance of constant DC voltage.

• Increased power transfer – Optimal utilization of insulation in converting existing lines from AC to DC may allow higher power transfer capacity with existing conductor temperature limits.

• Improvement in system operation – impact of ac-to-dc conversion on the allowable loading of parallel or contiguous ac circuits will be considered, including sensitivity of those effects to specific characteristics of dc terminal configurations, ratings, and modes of control

Expected Contributions from other Committees:

A broad evaluation of ac to dc line conversions requires input from planning, operations, and dc equipment study groups. Organization of a colloquium by the WG will allow input from these other CIGRE groups.

Deliverables and Time Schedule:

Technical brochure + ELECTRA summary: Guide to the conversion of existing AC lines to DC operation.

Time schedule:- to be published by end 2013.

Links with other SCs:
CIGRE SCs: B4, C1
CIGRE SC B2 AGB2.07

Approval by TC Chairman : Klaus Fröhlich Date : 30/03/2010