CIGRE Study Committee B4

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP (1)

WG* N° B4-70	**Name of Convenor :** DENNETIERE Sébastien (FRANCE) **E-mail address**: sebastien.dennetiere@rte-france.com
Technical Issues : 3	**Strategic Directions : 1**
The WG applies to distribution networks (4): No	
Title of the Group: Guide for Electromagnetic Transient Studies involving VSC converters	

Scope, deliverables and proposed time schedule of the Group :

Background :

More and more VSC converters are presently in operation or will be commissioned in the next few years. There is presently a lack of technical documentation that presents typical transients related to HVDC VSC converters. These types of transients can be initiated by faults on the AC or DC sides, energization of transformers or various events that involve the VSC converters. During such transients, the behavior of the converters is mainly driven by the HVDC protections that are now partially documented in literature.

Customers have access to very limited relevant information in the literature on the transients that occur in the vicinity and inside the converter stations. This type of information would also be useful for DC cable specifications. DC cables are designed to withstand the standard tests but customers and cable manufacturers are usually not aware of the transients that can be induced by VSC converters.

The main objective of this WG will be to present some typical transients that can occur in or in the vicinity of a HVDC VSC converter and the solutions to avoid or limit these transients. This work would refer to the available literature on VSC models for EMT studies. The point-to-point VSC HVDC link benchmark proposed by CIGRE WG B4-57 will be used to simulate and analyze the transients.

Scope :

The scope of the WG will be limited to EMT studies with VSC converters. It will provide guidelines for these studies. It will cover at least the following analyses:

- AC fault analysis – dynamic performance of converters
- DC fault analysis :
  - Faults in converter hall
  - Faults in DC cables / lines
- Temporary AC overvoltages
- Converter energization

Validation with field measurements (real systems or scale down prototypes) will be included in the scope of the WG.

No review of converter models for EMT studies will be performed. It has already been done by CIGRE B4-57 and available in many scientific papers. References of models will be provided for each study.

For each study, modeling guidelines will be provided.

Deliverables : Report to be published in Electra or technical brochure with summary in Electra 1) First year : Survey of EMT studies involving VSC converters. The survey will include control and protection functions involved in these studies 2) Second year : Used of generic models to illustrate EMT studies with VSC converters 3) Third year : Producing an Electra paper summarizing the above survey and investigation, and a final report to be submitted by January, 2018 **Time Schedule** : start : January 2015 **Final report** : 2018
Comments from Chairmen of SCs concerned : SC B4 received an indication from C4 that they would like to participate in the WG. WG B4-70 invites C4 to appoint a member to liaison with WG
Approval by Technical Committee Chairman : **Date** : 16/10/2014

(1) Joint Working Group (JWG) - (2) See attached table 1 – (3) See attached table 2
(4) Delete as appropriate

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 within distribution level and to the upstream network.
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 (cf. 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