CIGRE Study Committee C4

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP[1]

WG N° C4.46	**Name of Convenor: Filipe Faria da Silva** (Denmark) **E-mail address**: ffs@et.aau.dk Secretary: Konstantinos Velitsikakis (The Netherlands) (Konstantinos.Velitsikakis@dnvgl.com)
Strategic Directions #[2]: 1,2	**Technical Issues #[3]: 6,8**
The WG applies to distribution networks[4]: Yes / ~~No~~	
Potential Benefit of WG work #[6]: 3, 6	
Title of the Group: Evaluation of Temporary Overvoltages in Power Systems due to Low Order Harmonic Resonances	

Scope, deliverables and proposed time schedule of the Group:

Background:

The introduction of long HVAC underground cables and the integration of large offshore wind park projects at transmission levels via HVAC export cables impose important challenges to the System Operators. One of these challenges is related to the low harmonic order resonance frequencies. Several detailed electromagnetic transient (EMT) studies have shown that once excited, these resonance frequencies -especially the ones close to the 2nd harmonic- might result in Temporary Overvoltages (TOVs), which are characterized by longer durations and elevated amplitudes.

Although this type of overvoltages could impose severe dielectric and thermal stresses on equipment, they are not covered by International standards. With the exception of the metal-oxide surge arresters, there are also no standardized testing procedures related to the TOV capability of the equipment. Consequently, the withstand characteristics of already installed equipment is also unclear, as these were not included in the specifications. In the past, CIGRE WG33.10 published generic TOV withstand characteristics of High Voltage apparatus. These characteristics consider voltages of the fundamental power frequency, excluding the impact of harmonic distortion. Therefore, it is important that guidelines/methods to evaluate the TOVs in transmission systems are developed. These methods and their outcome could have a great impact on the decision-making during the planning process, by indicating whether remedial measures need to be considered against excessive TOVs.

Scope:

The Working Group will establish methods and guidelines regarding the evaluation of TOVs in transmission systems. The main tasks of the WG are as follows:

1. Review of existing standards and guidelines related to the impact of harmonic distortion on TOVs.
2. Review of existing standards and testing procedures of High Voltage equipment related to TOVs.
3. Review practices of TOV evaluation currently applied by utilities.
4. Specify criteria related to the evaluation of TOVs. The proposed criteria will be related to the dielectric and thermal impact of TOVs on the HV equipment.
5. Specify method(s) for analysing TOVs, as calculated through detailed system simulation models, and evaluating them based on the specified criteria.

Deliverables:

☒ Technical Brochure and Executive summary in Electra

☒ Electra report

☒ Tutorial[5]

Time Schedule: start: September 2017 **Final Report**: December 2019

Approval by Technical Committee Chairman:

Date: 18/09/2017

Notes: [1] or Joint Working Group (JWG), [2] See attached Table 2, [3]See attached Table 1, [4] Delete as appropriate, [5] Presentation of the work done by the WG, [6] See attached table 3

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
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 (ref. 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

Table 3: Potential benefit of work

1	Commercial, business or economic benefit for industry or the community can be identified as a direct result of this work
2	Existing or future high interest in the work from a wide range of stakeholders
3	Work is likely to contribute to new or revised industry standards or with other long term interest for the Electric Power Industry
4	State-of-the-art or innovative solutions or new technical direction
5	Guide or survey related to existing techniques. Or an update on past work or previous Technical Brochures
6	Work likely to have a safety or environmental benefit