CIGRE Study Committee A3

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

WG* A3.38	**Name of Convenor :** Edgar Dullni (DE) **E-mail address**: edgar.dullni@de.abb.com
Technical Issues # (2): 1, 7, 10	**Strategic Directions # (3): 2**
The WG applies to distribution networks (4): Yes	
Title of the Group: Shunt Capacitor Switching in distribution and transmission systems : Verification by tests and performance in service	

Scope, deliverables and proposed time schedule of the Group:

Background :

The installation of capacitor banks has steadily increased, mainly driven by power quality requirements of the network. CIGRE WGs 13.04 and A3.26 published surveys on shunt capacitor bank switching focusing on transmission networks in 1999 and 2015, respectively. The results were introduced shortly afterwards into the IEC circuit-breaker standard, IEC 62271-100.

A new WG will collect testing and service experience of capacitor switching in distribution networks and evaluate switching performance of medium voltage equipment to a higher degree than the former survey at transmission level. In particular, the prescribed capacitor inrush current of 20 kA is often discussed and meanwhile replaced in the standard IEEE C37.06-2009 by a variety of inrush currents.

This opens the question of how the performance of a switching device is linked to the peak of inrush current. Also, it would be useful to confirm that the type tests ensure the anticipated switching performance in service. Based on the proposal of the WG 13.04, the standard prescribed an increased number of switching operations at minimum arcing time in order to reduce the total number of tests and to classify a breaker to either class C2 or C1.

Scope :

1. Perform a survey on the actual use of capacitor banks in distribution and transmission networks with an analysis of user's switching practices (questionnaire to users or working group expertise).
2. Give possible new inputs for the standards, e.g. IEC 62271-100 and IEEE C37.09a and C37.06 with respect to test sequences, capacitive current and inrush currents.
3. Analyze the effectiveness of the prescribed accelerated test procedure focused on minimum arcing times and high inrush currents.
4. Give guidance to select a switching device for rated capacitive currents and inrush currents outside the switching parameters recommended in the standards and actually tested for medium and high voltage applications.
5. Collect data on the long term performance of capacitive switching devices, in particular on the probability of restrikes and consequences of restrikes and analyze the performance after 1000 CO and 10000 CO with respect to class C1 and C2.
6. Describe the state of the art of alternative devices to improve the capacitive switching performance (Controlled switching, use of semi-conductors, pre-insertion resistors etc at distribution levels).
7. Investigate the peculiarities of filter bank switching.

Deliverables : Report to be published in technical brochure with summary in Electra **Time Schedule** : start : July 2016	**Final report** : 2019
Comments from Chairmen of SCs concerned :	
Approval by Technical Committee Chairman : **Date** : 29/04/2016	M. Waldron

(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