CIGRE Study Committee A3

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG* N° A3.33	**Name of Convenor : LI Guofu (China)** **E-mail address: liguofu@epri.sgcc.com.cn**
Technical Issues # : 1	**Strategic Directions # : 2**
The WG applies to distribution networks : No	
Title of the Group: Experience with equipment for Series / Shunt Compensation	

Scope, deliverables and proposed time schedule of the Group :

Background :

As the series compensation technique can increase transmission capability of transmission lines significantly, it has been widely applied in extra high voltage (EHV) bulk power transmission systems. It also showed prospects for ultra high voltage (UHV) transmission systems. At the end of 2011, the first UHV series capacitor project has been put into service in China, and it plays a key role for increasing the transmission capacity of single UHV line up to 5 GW. The series capacitors will be widely used in the future UHV AC network of China. After sorting out the technical problems related to the implementation of series capacitor banks, in other countries having also the demand of delivering bulk power over long distance, UHV AC transmission with series compensation will be applied as well.

Moreover, recently thyristor controlled EHV series capacitor banks have been developed and put into service, as well as split series capacitor banks. Another development is that of fast acting by-pass gaps, that may have a strong impact on the specifications of equipment like line circuit-breakers and MOV to protect the series capacitor banks. New developments with shunt compensation (shunt reactors, shunt capacitor banks, SVC) can be mentioned as well, for instance compensation through tertiary windings of UHV/EHV transformers.

The experience with and consequences of such developments for the system and for the technical requirements are to be investigated. Aspects to be mentioned are phenomena not fully covered by the previous work of WG A3.13, A3.22 and A3.28: impact of series compensation on temporary / switching overvoltages and related restraints to the application of series compensation, impact on secondary arc extinction and consequentially requirements for involved equipment like 4-legged shunt reactors and/or HSES, impact of the new developments on TRV requirements for the line circuit-breakers and whether special recommendations for standardization are necessary, field experience with former and new applications of series / shunt compensation means and its consequences for utilities policy.

Objectives:

This WG will investigate the switching transient phenomena in relation to the developments with series / shunt compensation, including the requirements for the compensation means themselves (for instance: bypass switch, bypass gap, MOV, circuit-breakers, capacitors). The investigation includes also the impact of series / shunt compensation on transmission system's overvoltages, short circuit currents and secondary arc current extinction during system fault, consequential requirements for HV equipment, and the countermeasures to decrease the risk to system and nearby devices that come along with these phenomena. The WG will also investigate the field experience with these topics.

The investigations will be helpful for the optimized design of EHV and UHV AC power grid,

and will be helpful to standardization, where applicable.

The WG will actively cooperate with related SCs and IEC TCs, and build on the work of WG A3.13, A3.22, A3.26 and A3.28.

Scope :

The particular technical topics to be addressed by the WG are:

A. Investigation of developments and service experience with equipment for new series / shunt compensation.
Investigation of the impacts of system transients on the new equipment / components
Investigation of the impact of the new equipment / components on system transients and HV equipment requirements.

B. Addressing requirements for equipment / components applied to series / shunt compensation, for example
- UHV / EHV bypass switch
- (Fast acting) bypass gap
- UHV / EHV bypass isolating disconnector
- (Thyristor controlled) capacitor bank
- MO Varistor
- Equipment connected to transformer's tertiary windings.

C. Addressing requirements for HV equipment which is influenced by the new developments in series / shunt compensation: shunt reactors, HSES, circuit-breakers, MOSA

D. Special capacitor-bank applications for tertiary winding connected shunt compensation (which is not covered by WG A3.26)

Deliverables :
Technical brochure + ELECTRA summary: Late 2014.
Recommendations to related IEC Standards, such as 62271-100, -109, 60143. Late 2014

Time Schedule : start : 2013 **Final report** : 2015

Comments from Chairmen of SCs concerned : B3, C4, D1

Approval by Technical Committee Chairman :
Date : 20/05/2013

M. Wald

(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