CIGRE Study Committees C4 and A3

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

JWG N° C4/A3.53	**Name of Convenor:** Jinliang He (China) **E-mail address**: hejl@tsinghua.edu.cn
Strategic Directions #[2]: 1, 2, 4	**Technical Issues #[3]:** 10
The WG applies to distribution networks[4]: Yes	
Potential Benefit of WG work #[6]: 1, 3, 4	
Title of the Group: Application Effects of Low-Residual-Voltage Surge Arresters in Suppressing Overvoltages in UHV AC Systems	

Scope, deliverables and proposed time schedule of the Group:

Background:

The performance improvement of surge arrester results in much lower overvoltage level and better protection properties. This advantage can be observed from the significant change in insulation levels of power apparatus when ZnO (zinc-oxide) surge arresters replaced SiC (silicon carbide) ones.

UHV ac systems of 1000 kV have been built in some countries (Russia, Japan and Italy – limited to experimental installations) and have now been put into commercial operation in China since the beginning of 2009. The expectation is that UHV systems will become more widely used, and the suppression of overvoltages and hence reduction of construction costs of UHV systems is an important issue. The residual voltage is a key parameter of a surge arrester when considering the overvoltage suppression capability. If the residual voltage of a surge arrester is reduced, the overvoltage would be suppressed to a lower level, and the manufacturing costs of high voltage power apparatus, especially the UHV power apparatus, will be decreased. The low-residual-voltage surge arresters have been developed worldwide and have been put into operation, including surge arresters with low-residual-voltage metal-oxide varistors (MOVs) and low-rated-voltage, and controllable surge arresters.

Considerable work on ZnO varistors and surge arresters have been completed in CIGRE SC A3 such as Technical Brochures 693 and 696. Currently WG A3.39 is investigating the field performance on UHV metal-oxide surge arresters. These works will be fundamental starting points for this working group.

The objective of this working group therefore is to summarize the state of low-residual-voltage surge arresters, including advanced MOV technology, and analyse the application effects of different kinds of low-residual-voltage surge arresters for 1000 kV UHV ac systems in suppressing switching and lightning overvoltages.

Scope:

1. Summarize the development states of low-residual-voltage surge arresters, including surge arresters with low-residual-voltage MOVs, low-rated-voltage surge arresters, and controllable surge arresters.
2. Analyse the application effects of different kind of low-residual-voltage surge arresters, in supressing switching overvoltages in 1000 kV UHV ac systems.
3. Analyse the application effects of low-residual-voltage surge arresters, in supressing lightning overvoltages in 1000 kV UHV ac systems.
4. Discuss implications of eliminating closing resistors for breakers in 1000 kV UHV ac system by surge arresters.

Deliverables:

☒ Technical Brochure and Executive summary in Electra

☒ Electra report

☒ Tutorial[5]

Time Schedule: start: February 2019 **Final Report**: February 2021

Approval by Technical Committee Chairman:

Date: December 12th, 2018

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