CIGRE Study Committee SCA3

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG [1]N° A3.45	**Name of Convenor:** Dr. Erik Sperling (Switzerland)
Technical Issues #[2]: 1, 6	**Strategic Directions #[3]:** 1
The WG applies to distribution networks[4]: Yes	
Potential Benefit of WG work #[5]: 2, 4	
Title of the Group: Methods for identification of frequency response characteristic of voltage measurement systems	

Scope, deliverables and proposed time schedule of the WG:

Background:

Energy production is currently moving away from conventional methods, such as nuclear power plants or coal and gas power plants, towards new resources such as wind, solar or geothermal power. The connection of these new resources to power networks will mostly be implemented by electronic converters. Some of these energy sources are dependent on natural phenomena and lead to increasing switching operations. A second important issue is the locally concentrated production of new energy, for example in off-shore wind parks, with respect to the location of the main industrial centres in Europe. The existing transmission line system is currently operating on the limits of their initial design. Today, ideas such as combined transmission overhead lines (hybrid networks) with AC and DC power are becoming more and more important with respect to the transmission of high quantities of energy to the region where it is needed.

All the examples mentioned above, as well as the increased use of intermeshed network systems in Europe, have an influence on the power quality of the energy. Thus, continuous voltage signals beginning from DC as an offset up to several 10 kHz can appear. For transient voltage signals, the resulting frequency may be in the range from 0.5 MHz up to 10 MHz.

The results of initial measurements made with different kind of conventional instrument transformers in HV and EHV networks show that frequency response is dependent on system voltage. Based on these results and the technical report IEC/TR61869-103 published in 2012, the necessity of correct measurement results up to a higher frequency range is required in order to attain the required power quality parameters and protect the installed high voltage equipment in service.

The idea of the proposed working group is to start with a collection of relevant international published literature. In a second step, the relevant instrument voltage transformers based on the conventional technology as well as on the non-conventional low power technologies (both analog and digital) will be analysed and categorized. Discussions about physical dependencies and influences on the accuracy will be made and mathematically described depending on test levels, test frequency ranges and type of test frequencies like single sweep, multi frequencies or transient step-functions with high spectra of frequencies.

Scope:

1. Theoretical (mathematical and physical) discussions about the frequency and voltage dependent response characteristic and accuracy behaviour
2. Dependencies and interference of the response characteristics
3. Analysis and evaluation of possible measuring procedures for the frequency response measurement
4. Recommendations about relevant test setups incl. a proposal for test interval or test definition like routine, type or special test
5. Proposal of sufficient accuracy classes, frequency ranges and test voltage levels.

The working group will be supported by liaison from C4 Committee.

Deliverables:

☒ Technical Brochure and Executive Summary in Electra

☒ Electra Report

☒ Tutorial[6]

☒ Webinar[6]

Time Schedule: start: November 2019 **Final Report**: March 2022

Approval by Technical Council Chairman:

Date: November 5th, 2019

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

Table 1: Technical Issues for creation of a new WG

1	Active Distribution Networks resulting in bidirectional power and data flows within distribution levels up to higher voltage networks
2	Digitalization of the Electric Power Units (EPU): Real-time data acquisition includes advanced metering, processing large data sets (Big Data), emerging technologies such as Internet of Things (IoT), 3D, virtual and augmented reality, secure and efficient telecommunication network
3	The growth of direct current (DC) and power electronics (PE) at all voltage levels and its impact on power quality, system control, system operation, system security and standardisation
4	The need for the development and significant installation of energy storage systems and electric transportation, considering the impact they can have on the power system development, operation and performance
5	New concepts for system operation, control and planning to take account of active customer interactions, and different generation types, and new technology solutions for active and reactive power flow control
6	New concepts for protection to respond to the developing grid and different generation characteristics
7	New concepts in all aspects of power systems to take into account increasing environmental constraints and to address relevant sustainable development goals.
8	New tools for system technical performance assessment, because of new Customer, Generator and Network characteristics
9	Increase of right of way capacity through the use of overhead, underground and submarine infrastructure, and its consequence on the technical performance and reliability of the network
10	An increasing need for keeping Stakeholders and Regulators aware of the technical and commercial consequences and keeping them engaged during the development of their future network

Table 2: Strategic directions of the Technical Council

1	The electrical power system of the future: respond to speed of changes in the industry
2	Making the best use of the existing systems
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, social and economic benefits 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 directions
5	Guide or survey related to existing techniques; or an update on past work or previous Technical Brochures
6	Work likely to contribute to improved safety.
7	Work addressing environmental requirements and sustainable development goals.