CIGRE Study Committee B3

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

WG N° B3.52	**Name of Convenor:** Jinzhong Li (China) **E-mail address**: lijz@epri.sgcc.com.cn
Strategic Directions #[2]: 2	**Technical Issues #[3]: 5,6,9**
The WG applies to distribution networks[4]: Yes	
Potential Benefit of WG work #[6]: **1,3,5**	
Title of the Group: Neutral Grounding Method Selection and Fault Handling for Substations in the Distribution Grid	

Scope, deliverables and proposed time schedule of the Group:

Background:

A variety of neutral grounding methods for substations in distribution grids have been applied in different countries and each method has its own characteristics and scope of application. Currently, arc suppression coils are installed in some substations. Due to the rapid development of the distribution grid and extensive use of cables in some countries, the system-to-ground capacitive current has increased significantly, and increasingly the reserve capacity of arc suppression coils cannot cover these increasing amounts of capacitive current.

In this context, when single phase grounding faults occur in the distribution network, the residual current at the fault point might be high, resulting in failure of the grounding transformer and arc suppression coil. In addition, since many of the arc suppression coils have been operated long-term with insufficient compensation, over-voltage due to resonance is more likely to occur, which brings risks for power system insulation integrity. In recent years, several accidents caused by single-phase grounding faults have occurred, influencing negatively on the safe operation of the power grid.

Based on the challenges mentioned above, the selection principle for the neutral grounding method for a substation in a distribution grid, grounding fault detection and handling technology should be thoroughly studied, to improve equipment operation and reliability, the stability of the power grid and also safety. The application scope and related equipment requirements of different neutral grounding methods should also be summarized.

Scope:

(1) To investigate the development status of the various substation neutral grounding methods used in different countries, and to study new and advanced neutral grounding methods.

(2) To compare and evaluate the basic principles, advantages and disadvantages, and application scope of different neutral grounding methods, in order to provide a basis and reference for neutral grounding method selection for substations in the distribution grid.

(3) To research and evaluate the advantages and disadvantages of various methods of capacitive current measurement, which could provide the basis for parameter setting of neutral grounding equipment and relay protection system.

(4) To define roles and responsibilities between different companies in terms of grounding method selection and the accountability of implementation.

(5) To study grounding fault detection technology, including data acquisition, and test technology, including high resistance grounding fault detection technology and multi-type fault diagnosis technology in distribution grids with high penetration of distributed power sources.

(6) To study grounding fault handling technologies, including new fault handling methods, and equipment application such as arc suppression using a transfer switch.

(7) To study the main factors causing personal electric shock injury due to single-phase faults in distribution network, and to propose a comprehensive evaluation method of single-phase fault handling technology in order to improve personal safety.

Deliverables:

☒ Technical Brochure and Executive summary in Electra

☒ Electra report

☒ Tutorial[5]

Time Schedule: start: September 2018 **Final Report**: September 2021

Approval by Technical Council Chairman:

Date: 21/08/2018

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