CIGRE Study Committee B2

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

WG* N°B2.56	**Name of Convenor :** George Watt (Canada) **E-mail address**: george.watt@hydroone.com

Technical Issues # (2): 9 **Increase ROW capacity & use of OHL and its consequence on the technical performance & network reliability**	**Strategic Directions # (3): 2** **Making the best use of existing system**

The WG applies to distribution networks (4): No

Title of the Group:

Ground Potential Rise at Overhead AC Transmission Line Structures during Faults

Scope, deliverables and proposed time schedule of the Group :

Background :

When a line to ground fault occurs on an AC transmission line, the ground fault current will flow through many conductive paths. One of the typical paths of the current flow is to or from the ground/earth. This generates potential on the line structure and voltage gradients on the surface of the ground around the structure.

The ground surface voltage gradients and the magnitudes of potential rises on the line structure and any metallic objects bonded to or close to the structure will depend on: structure location relative to the ground fault, fault current magnitude, phase conductor to overhead ground conductor coupling, and soil resistivity.

The grounding system design for the line structure and any installations bonded to the line structure or in close proximity is (a) to provide a means to dissipate fault currents into the ground/earth without causing damage to the facilities; (b) to protect personnel in the vicinity of grounded facilities from the hazard of electrical shock.

Scope :

Prepare Technical Brochure and organize a technical colloquium on examining the touch potential and ground potential rise in the vicinity of overhead transmission structure during line to ground faults of AC transmission lines.

Sources of fault current, its magnitude and distribution will be analyzed.

Conductive or transfer effects associated with the fault current are treated.

Impact on electrical facilities and installations bonded to or in close vicinity of the line structure will be described.

The tolerable/acceptable levels of step and touch potentials will be reviewed.

Design and selection of mitigation solutions are described.

Line design considerations, such as footing resistance, overhead ground wire/shieldwire, cross-bonding, insulation, etc., that will impact on line performance under fault conditions will be examined.

Reference to case studies will be presented.

Any new IEC and EN standards dealing with certain aspects of the topic will be identified.

This guide does not deal with induction from adjacent lines or inductive effects on pipelines, etc. under normal operating and fault conditions.

Specific topics to be considered:

1. Fault current aspects – sources (ac system, power frequency), magnitude, distribution of current flows between the grounding system and surrounding earth.

2. Design methodology and analytical modeling aspects – line parameters, fault current (line/phase to ground fault), grounding system, soil, soil heating effect, line structure grounding system, field measurements

3. Environment aspects – soil resistivity

4. Mitigation and remedial measures aspects – control device design and practices

5. Safety aspects – electrical shock safety criteria, regulatory and industry reference standards

6. Line performance under fault conditions aspects – line design considerations, e.g., footing resistance, overhead ground/shield wire, cross-bonding, insulation, fault clearing time, etc.

7. Conductive co-ordination aspects – impact on communication system installation, underground lines and facilities, fences, distribution lines and equipment neutral grounding/earthing under fault conditions

Deliverables : Report to be published in Electra or technical brochure with summary in Electra

Time Schedule : start : August 2012 **Final report** : December, 2015

Comments from Chairmen of SCs concerned :

Approval by Technical Committee Chairman : Klaus Fröhlich
Date :17/08/2012

(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	Interactive communication with the public and with political decision maker