CIGRE Study Committee B5: PROPOSAL FOR CREATION OF A NEW WORKING GROUP (1)

WG* N° B5.55	**Name of Convenor:** Armando Guzman (US), **Co-convenor:** Xinzhou Dong (CN)
Technical Issues #: 6	**Strategic Directions #: 1, 2**

The WG applies to distribution networks (4): Yes

Title of the Group: Application of Travelling Wave Technology for Protection and Automation

Scope, deliverables and proposed time schedule of the Group :

Background :

When a short-circuit occurs on a power system, protection relays detect the fault and trip the circuit breakers required to clear the fault, without adversely affecting healthy parts of the network. The protection decision generally involves the location and classification of the fault and an assessment of how best to isolate the fault. Also, reclosers can be enabled or disabled by the protections to support the automatons charged to restore the service of the faulted part of the network. If the fault is permanent and restoration cannot be achieved by auto-reclosure of circuit breakers, the fault must be accurately located and the information used to control customer reconnection strategies and the subsequent operation of search and repair crews. The priority is to restore power to all consumers as quickly as possible.

With over 60 years of history, travelling wave (TW) based fault location devices are now an accepted and trusted method of enhancing the performance of T&D networks, reducing customer outage time, restoring supply and accurately locating a fault. In the 1950s, TW-based fault location were first developed and implemented, but applications were limited due to inadequacies of technology in replacing human interpretation of fault records. In the 1970s and 1980s considerable work has been done on TW-based protection principles.

Scope :

The remit of the proposed working group concerns the role of TW techniques in the detection, classification and location of faults, and the subsequent isolation and restoration strategies. The scope includes the use of TW techniques on radial, interconnected and meshed overhead and underground distribution and transmission networks. The WG shall also investigate the opportunity of implementing TW techniques in protection relays, adaptive auto-reclosers, fault locators and automation schemes.

The WG report is expected to cover the following subjects:

- enhancement of conventional protection on transmission lines using TW including detection and location of high impedance faults;
- solutions based on TW techniques for limitations of conventional protections on transmission networks with low fault current levels and inverter-based sources;
- comparison between operating performances of impedance-based and TW-based fault locators on transmission and distribution networks including detection and location of single-line to ground faults on non-effective grounded networks, and dispersed generation;
- use of TW based approaches on mixed overhead / underground lines for disabling reclosure schemes for faults on underground sections;
- use of TW based approaches to characterize the fault (permanent vs. transient fault, cable fault vs. overhead line fault, High Impedance Fault (HIF) , etc).

References:

WG B5.52 - Analysis and comparison of Fault location systems in Substation Automation Systems

TB587 - Protection of hybrid line/cable circuits in transmission networks

Deliverables :

- Technical Brochure

• Summary in Electra • Tutorial Proposal Forms • Power Point slides for Tutorial **Time Schedule** : start : January 2015 **Final report** 2022
Comments from Chairmen of SCs concerned :
Approval by Technical Committee Chairman : M. Waldron **Date** : 08/01/2015

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