CIGRE Study Committee B5

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

WG N° B5.71	**Name of Convenor:** Cédric MOORS (BE)
Technical Issues #[1]: 1, 2, 5, 6	**Strategic Directions #[2]: 1, 2**
The WG applies to distribution networks: yes	
Potential Benefit of WG work #[3]: 1, 2, 3, 4	
Title of the Group: Protection, Automation and Control Systems Communication Requirements for Inter-Substation and Wide Area Applications	

Scope, deliverables and proposed time schedule of the Group:

Background:

The traditional use of protection and automation functions of inter-substation communication includes

1. Unit protection schemes (Line Differential Protection),
2. Blocking and Permissive Overreach schemes for Distance Protection
3. Remote tripping schemes
4. Remote disabling of recloser functions.
5. System Protection Schemes (SPS)

The legacy inter-substation communication links and technologies used for these functions are often obsolescent and no longer supported and are being migrated to packet-based communication.
In the same time, several new Protection, Automation and Control Systems (PACS) applications and functions using inter-substation or Wide Area communication emerge, including functions related to implementation of Renewable Energy Sources (RES) in distribution or transmission networks.

This subject corresponds to the Preferential Subject #3 of the CIGRE SC B5 colloquium 2019, the papers, special report and prepared contribution of which can be used as input information for the WG.

Scope:

1. Assessment of communication requirements and constraints related to existing and new applications
    a. Wide Area Monitoring / Protection / Control systems (WAMPACSs) zone or regional Automatons,
    b. Established inter-substation protection functions
        i. line differential protections,
        ii. distance protections with blocking and permissive overreach schemes
    c. inter-substation interlocking logic (e.g. position of earth switch and disconnector on the other line side),
    d. Load or generator shedding (used in zonal /regional automation systems) including the volume of active / reactive power to be shed
    e. Exchange of information between substations for RES and between DSO and TSO
    f. Setting points for voltage, P or Q reference or other ancillary services
    g. Remote tripping

h. Remote Recloser disabling
i. Communication for fault location applications (Travelling Waves based, Impedance based).
j. Distribution automation applications
k. others

2. Use of packet-based communication technology for PACS
    a. General
        i. Advantages and disadvantages
        ii. High level description of the various packet-based solutions (including emulation),
        iii. Mapping to requirements and constraints identified in 1).
        iv. Availability and time-line of development
    b. Expected performance for different application scenarios
        i. bandwidth,
        ii. time jitter,
        iii. latency,
        iv. tolerable packet loss
        v. switch over time to redundant channel
    c. Assessment of applicability of packet-based communication systems
        i. for sampling synchronization based applications (Line Differential protection, application using synchronized phasors, etc).
        ii. for protection schemes based on transmission of binary values (Blocking or Permissive Over Reaching Transfer Trip (POTT) schemes associated to distance protection)
    d. Recommend communication configuration and protocol for inter-substation PACS applications
        i. Generic Object Oriented Substation Event (GOOSE) / Routable Generic Object Oriented Substation Event (R-GOOSE)
        ii. Sample Values (SV) / Routable Sample Values (R-SV)
        iii. other

3. Migration strategies to packet-based communication technology
    a. Expected evolution and availability of the currently applied (legacy) communication technologies (e.g. Streaming High Definition (SDH)/ Plesiochronous Digital Hierarchy (PDH)
    b. Migration from legacy technologies, including migration of functions requiring high communication availability

4. Support of Time Synchronization (avoid overlap with JWG B5/D2.67)

5. Current state of applications using inter-substation communications (including communication topology, meshed or star-type), user expectations and assessment of industry road map

The WG will have a Liaison member from SC D2.

Exclusions

- Discussion and evaluation of technologies used for inter-substation communications. They are within the scope of SC D2.

Deliverables:

☒ Technical Brochure and Executive summary in Electra

☒ Electra report

☒ Tutorial[6]

☒ Webinar[6]

Time Schedule : start : June 2020 **Final report** : June 2023

Approval by Technical Committee Chairman:

Date: January, 16th, 2020

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.