

**CIGRE Study Committee B5**

**PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP<sup>1</sup>**

<b>WG N° B5.71</b>	<b>Name of Convenor:</b> Cédric MOORS (BE) <b>E-mail address:</b> cedric.moors@elia.be
<b>Technical Issues #<sup>1</sup>:</b> 1, 2, 5, 6	<b>Strategic Directions #<sup>2</sup>:</b> 1, 2
<b>The WG applies to distribution networks: yes</b>	
<b>Potential Benefit of WG work #<sup>3</sup>:</b> 1, 2, 3, 4	
<b>Title of the Group: Protection, Automation and Control Systems Communication Requirements for Inter-Substation and Wide Area Applications</b>	
<b>Scope, deliverables and proposed time schedule of the Group:</b> <b>Background:</b> <p>The traditional use of protection and automation functions of inter-substation communication includes</p> <ol style="list-style-type: none"> <li>1. Unit protection schemes (Line Differential Protection),</li> <li>2. Blocking and Permissive Overreach schemes for Distance Protection</li> <li>3. Remote tripping schemes</li> <li>4. Remote disabling of recloser functions.</li> <li>5. System Protection Schemes (SPS)</li> </ol> <p>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.</p> <p>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.</p> <p>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.</p>	
<b>Scope:</b> <ol style="list-style-type: none"> <li>1. Assessment of communication requirements and constraints related to existing and new applications <ol style="list-style-type: none"> <li>a. Wide Area Monitoring / Protection / Control systems (WAMPACSSs) zone or regional Automaton,</li> <li>b. Established inter-substation protection functions <ol style="list-style-type: none"> <li>i. line differential protections,</li> <li>ii. distance protections with blocking and permissive overreach schemes</li> </ol> </li> <li>c. inter-substation interlocking logic (e.g. position of earth switch and disconnecter on the other line side),</li> <li>d. Load or generator shedding (used in zonal / regional automation systems) including the volume of active / reactive power to be shed</li> <li>e. Exchange of information between substations for RES and between DSO and TSO</li> <li>f. Setting points for voltage, P or Q reference or other ancillary services</li> <li>g. Remote tripping</li> </ol> </li> </ol>	

- 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<sup>6</sup>
- Webinar<sup>6</sup>

**Time Schedule** : start : June 2020

**Final report** : June 2023

**Approval by Technical Committee Chairman:**

**Date:** January, 16th, 2020



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

**Table 1: Technical Issues for creation of a new WG**

<b>1</b>	Active Distribution Networks resulting in bidirectional power and data flows within distribution levels up to higher voltage networks
<b>2</b>	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
<b>3</b>	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
<b>4</b>	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
<b>5</b>	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
<b>6</b>	New concepts for protection to respond to the developing grid and different generation characteristics
<b>7</b>	New concepts in all aspects of power systems to take into account increasing environmental constraints and to address relevant sustainable development goals.
<b>8</b>	New tools for system technical performance assessment, because of new Customer, Generator and Network characteristics
<b>9</b>	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
<b>10</b>	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**

<b>1</b>	The electrical power system of the future: respond to speed of changes in the industry
<b>2</b>	Making the best use of the existing systems
<b>3</b>	Focus on the environment and sustainability
<b>4</b>	Preparation of material readable for non-technical audience

**Table 3: Potential benefit of work**

<b>1</b>	Commercial, business, social and economic benefits for industry or the community can be identified as a direct result of this work
<b>2</b>	Existing or future high interest in the work from a wide range of stakeholders
<b>3</b>	Work is likely to contribute to new or revised industry standards or with other long term interest for the Electric Power Industry
<b>4</b>	State-of-the-art or innovative solutions or new technical directions
<b>5</b>	Guide or survey related to existing techniques; or an update on past work or previous Technical Brochures
<b>6</b>	Work likely to contribute to improved safety.
<b>7</b>	Work addressing environmental requirements and sustainable development goals.