**CIGRE Study Committee B5**

## PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

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| **WG N° B5.73** | **Name of Convenor:** André, Bruno (FR)<br>**E-mail address**: bruno.andre@se.com |
| **Strategic Directions #[2]: 1** | **Sustainable Development Goal #[3]: 9, 13** |
| **The WG applies to distribution networks: ☒ Yes / ☐ No** | |
| **Potential Benefit of WG work #[4]: 1, 2, 3, 4** | |
| **Title of the Group: Experiences and Trends related to Protection Automation and Control Systems Functional Integration** | |

**Scope, deliverables and proposed time schedule of the WG:**

**Background:**

In the last years, different factors have been pushing towards a higher level of integration of functions in Protection Automation and Control Systems (PACS), including:

1. enhanced computing performances offered by the progress of hardware;
2. increasing adoption of process bus;
3. need for space saving;
4. pressure to reduce investment costs;
5. increasing acceptance by users of multiple functions integrated in the same equipment.

In addition to this, new concepts have emerged going beyond the "simple" integration of multiple functions in one Intelligent Electronic Device (IED) or computer. These concepts include the use virtualisation of PACS components (servers or IED) and the possibility to envisage "app style" functions to upload in manufacturer neutral PACS.

These aspects of enhanced functional integration raise multiple issues regarding the life cycle management of the PACS. The existing TB 404 on Acceptable Functional Integration from 2010 does not cover these aspects and needs to be revised.

**Scope:**

1. State of the art and perspectives of integration of automation, control, monitoring, metering and protection functions
2. Aspects related to the virtualisation of functions
3. Configuration and interfacing of integrated functions and subfunctions
4. Aspects related to the transition to integrated architectures for substation level functions (Gateway, Human-Machine Interface (HMI), auxiliary and housekeeping functions)
5. Impact of these trends on
    a. the PACS architecture including its communication system
    b. conventional redundancy concepts, including treatment of redundant sampling data and controlling targets and interlocking strategy for redundant function.
    c. Testing and commissioning
    d. Constraints for setting or configuration of functions (without affecting others)
    e. Unit protection systems (e.g. line differential protection)
6. Technical limits and other constraints for functional integration
    a. Availability and Reliability
    b. Redundancy and acceptable common modes
    c. Maintainability
    d. Testability

e. Acceptability of implementation of functions in the same hardware platform (IED or server)

7. Impact of Functional Integration on asset management of the PACS
    a. advantages / drawbacks of functional integration of
        i. process near IED (Merging Unit (MU)/ Bay Intelligent Electronic Device (BIED))
        ii. Bay Control Unit (BCU) or protection IED
        iii. IEDs or equipment hosting substation level functions
    b. possibility and standardization of integration of functional components from different suppliers
    c. responsibility of the product integrator if components come from different suppliers.
    d. impact on utility management, organisation, engineering and maintenance
    e. Use of data logging
8. Cyber Security aspects related to Functional Integration (advantages and drawbacks)
9. Experience feedback.

Relations to other WG

- Findings of WG B5.59 (Near Process Units requirements) have to be taken into account and referenced.
- Findings of WG B5.60 (PAC Systems with Hardware Independent Functionality) have to be taken into account and referenced.
- TB 404 (Acceptable Functional Integration) has to be referenced and evolutions with respect of this TB have to be highlighted.
- Findings of WG B5.70 (Reliability of Protection Automation and Control System (PACS) of power systems – Evaluation Methods and Comparison of Architectures) have to be taken into account and referenced.

Exclusions

- Hardware independent functions are covered by WG B5.60 and are not in the scope of this WG.

**Deliverables:**

☒ Technical Brochure and Executive Summary in Electra
☒ Electra Report
☐ Future Connections
☐ CSE
☒ Tutorial
☒ Webinar

**Time Schedule**: start: June 2020 **Final Report**: December 2023

**Approval by Technical Council Chairman**:

**Date**: May 25th, 2020

Notes: [1] Working Group (WG) or Joint WG (JWG), [2] See attached Table 1, [3] See attached Table 2 and CIGRE reference Paper: Sustainability – at the heart of CIGRE's work. [4] See attached Table 3

**Table 1: Strategic directions of the Technical Council**

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| **1** | The electrical power system of the future reinforcing the End-to-End nature of CIGRE: respond to speed of changes in the industry by preparing and disseminating state-of-the-art technological advances |
| **2** | Making the best use of the existing systems |
| **3** | Focus on the environment and sustainability (in case the WG shows a direct contribution to at least one SDG) |
| **4** | Preparation of material readable for non-technical audience |

**Table 2: Environmental requirements and sustainable development goals**

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| | CIGRE selected the 7 SDGs that are the most relevant to CIGRE. In case the WG work refers to other SDGs or do not address any specific SDG, it will be quoted 0. |
| **0** | Other SDGs or not applied |
| **7** | **SDG 7: Affordable and clean energy**<br>Increase share of renewable energy; e.g. expand infrastructure for supplying sustainable energy services; ensure universal access to affordable, reliable, and modern energy services; energy efficiency; facilitate access to clean energy research and technology |
| **9** | **SDG 9: Industry, innovation and infrastructure**<br>Facilitate sustainable infrastructure development; facilitate technological and technical support |
| **11** | **SDG 11: Sustainable cities and communities**<br>Increase attention on sustainable and resilient buildings utilizing local (raw) materials, power for electric vehicles, strengthening long-line transmission and distribution systems to import necessary power to cities, developing micro-grids to reinforce the sustainable nature of cities; protect and safeguard the world's cultural and natural heritage; reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and waste management |
| **12** | **SDG 12: Responsible consumption and production**<br>E.g. Promote public procurement practices that are sustainable; address reducing use of SF6 and promote alternatives, encourage companies to adopt sustainable practices and to integrate sustainability information into their reporting cycle, address inefficient fossil-fuel subsidies that encourage wasteful consumption |
| **13** | **SDG 13: Climate action**<br>E.g. Increase share of renewable or other $CO_2$-free energy; energy efficiency; expand infrastructure for supplying sustainable energy; strengthen resilience and adaptive capacity to climate-related hazards and natural disasters; integrate climate change measures into national policies, strategies and planning; improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning |
| **14** | **SDG 14: Life below water**<br>E.g. Effects of offshore windfarms; effects of submarine cables on sea-life |
| **15** | **SDG 15: Life on land**<br>E.g. Attention for vegetation management; bird collisions; integration of substations and lines into the landscape |

**Table 3: Potential benefit of work**

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| **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. |