CIGRE Study committe B5

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG B5.88

NAME OF THE CONVENOR
Patriota de Siqueira Iony (BRAZIL)

TITLE
Implementation Guide for fully digital IEC 61850-based Protection, Automation and Control Systems

THE WG APPLIES TO DISTRIBUTION NETWORKS: YES

ENERGY TRANSITION
3 / Digitalization

POTENTIAL BENEFIT OF WG WORK
1 / commercial, business, social, economic benefits
2 / potential interest from a wide range of stakeholders
3 / likely to contribute to new or revised industry standards
4 / state-of-the-art or innovative solutions or directions
5 / Guide or survey on techniques, or updates on past work or brochures
6 / work likely to contribute to improve safety

STRATEGIC DIRECTION
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-ofthe-art technological advances
2 / Making the best use of the existing systems

SUSTAINABLE DEVELOPMENT GOAL
9 / Industry, innovation and infrastructure

BACKGROUND :
An increasing number of utilities have taken the decision to implement IEC 61850 based fully digital Protection Automation and Control Systems (PACS). A rich experience feedback, for PACS featuring both station bus and process bus is available, including numerous published papers [1].

Many users have decided to use components from different manufactures and to execute the system integration either themselves or by a manufacturer-independent system integrator. This approach requires new knowledge, which is often not available within the utility starting the process and which needs to be acquired. Several users have highlighted the need for a comprehensive guide for these utilities [2] [3] in order to facilitate and to give guidance for the implementation of IEC 61850 based PACS

PURPOSE / OBJECTIVE / BENEFIT OF THIS WORK :
Provide a comprehensive guide with recommendations ("dos and don'ts") for utilities planning to deploy IEC 61850-based PACS. Explications and information related to the listed aspects are to be kept short, as this TB cannot go into depth in the different subjects. For explication and discussion of IEC 61850, refer to other publications (e.g.. the B5 Green Book [4]. One of the aspects to be covered is the chain for applying settings to different PACS functions.

SCOPE :

The WG shall cover the following aspects related to IEC 61850-based PACS and provide recommendations and basic explications and information related to these aspects. If several design options are possible, their advantages and drawbacks should be discussed.

- Review of constraints and challenges for utilities and possible mitigation
  - IEC 61850 know-how and training
  - IEC 61850 data models for functions implemented in PACS
  - IEC 61850 configuration chain, generation and update of SCD files
  - Specification of the IEC 61850 interface capabilities of IEDs (PICS, PIXIT, metrics)
  - Functional interoperability, specification and validation of functional chains
  - Definition and use of Basic Application Profiles
  - Interoperability requirements for configuration, supervision and administration
  - Test and validation strategy for components and component integration
  - Management of component and system variants (e.g. different types of feeders, IED from different vendors, different configurations of functions, etc.)
  - Development and characteristic of HMI
- Large scale deployment of fully digital substations
  - Recommendations for engineering and templates for IEC 61850 based PACS
  - Generation of SCD files adapted to series deployment using base characteristics of substations and feeders
  - Implementation of SCT and ICT
  - Transmission of configurations and settings from utility data centers to PACS for FAT, SAT and updates during maintenance

For settings of protection, automation and control functions using IEC 61850 Data Objects or Data Attributes, the following aspects shall be discussed:

- Review of available Data Objects to model settings and identification of shortcomings
- Assessment of the need of generic setting LN
- Recommendations for handling of settings expressed as IEC 61850 Data Objects
- Recommendations for the handling of manufacturer specific settings not covered by IEC 61850 Data Objects
- Conversion of settings to IEC 61850 Data Objects
- Examples of settings expressed as IEC 61850 Data Objects for protection functions

Out of scope:

- "Optimisation of the IEC 61850 Protection, Automation and Control Systems (PACS) engineering process and tools Architecture" – This subject is covered by ongoing B5.68. The PACS Architecture and consistency are out of scope.
- Virtualisation and functional integration of PACS are out of scope
- Setting management and elaboration of settings for the different PACS functions are out of scope. Setting management has been covered in TB 539 (WG B5.31), which can be referred to.
- Documentation aspects are covered by B5.63 and are out of scope of this WG
- Introduction and detailed description of IEC 61850 features. The CIGRE B5 Green Book [4] can be referred to.

When appropriate, these items can be mentioned and referenced in the TB developed by the WG.

References

[1]   TB CIGRE B5.69 "Experience gained and Recommendations for Implementation of Process Bus in Protection, Automation and Control" – to be published

[2]   B. Heimisson, T. Jónsson, P. Mohapatra, F. Steinhauser: Large scale application of fully Digital Substations at LANDSNET, Iceland – Paper 10641 CIGRE Session 2022 – SC B5 PS3

[3]   G. Wilson: Honoring the Standards, A Digital Substation for Dummies Design Journey – PAC World Conference 2023 Paper WEA01

[4]   P. Bishop, N. Nair: IEC 61850 – Principles and Applications to Electric Power System. CIGRE Green Book - 2nd Edition Springer 2022

DELIVERABLES AND EVENTS

Deliverables Types
Electra report
Technical Brochure and Executive Summary in Electra
Tutorial

Time schedule

Q2	2025	Recruit members (National Committees)
Q4	2025	Develop final work plan
Q4	2028	Draft TB for Study Committee Review
Q2	2029	Final TB and other deliverables

APPROVAL BY TECHNICAL COUNCIL CHAIRMAN:
Rannveig S. J. Løken
January 13th, 2025