CIGRE Study Committee B5

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

WG N° B5.70	**Name of Convenor :** Alexander Voloshin (RU) **E-mail address**: voloshin.aa@yandex.ru
Strategic Directions #[2]: 1 & 2	**Technical Issues #[3]:** 6, 8 & 10
The WG applies to distribution networks[4]: Yes	
Potential Benefit of WG work #[6]: 2, 3	
Title of the Group: Reliability of Protection Automation and Control System (PACS) of power systems – Evaluation Methods and Comparison of Architectures	

Scope, deliverables and proposed time schedule of the Group:

Background:

There are a number of factors which can affect the reliability of Protection Automation and Control System (PACS) functions of power systems, from architectures to human errors. The purpose of the WG is to explore the factors affecting reliability and operation for different aspects of power system protection, automation and control including PACS functions related to:

- Transmission circuits
- Distribution circuits
- Transformers
- Generators
- Busbars

The work defines reliability as availability (ability to be in a state to perform as and when required, under given conditions, assuming that the necessary external resources are provided), dependability (collective term describing the availability performance of any simple to complex product.) and security (ability to avoid unwanted operations).

Scope:

The aim of the WG will be to produce a guide for reliability calculation and its specification for PACS functions and architecture. It will develop methodologies for evaluating reliability including:

- Overall architectures from integrated devices to full process bus
- Allocation of PACS function and redundancy methods
- Hardware, firmware, communications
- Software, algorithms, configuration and parameters
- Causes, impact and mitigation of human errors in configuration and maintenance, including tools and processes
- Failure rates of different PACS components and types of failures.
- Consequences of failures

The work will also consider the following:

- Justification of requirements
- Compliance with performance requirements
- Human factors
- Risk assessment

The WG will make reference to the work of the following WGs as applicable:

- B5.13 and it's TB 404 (Acceptable Functional Integration in HV Substations)
- B5.42 and it's TB 687 (Experience Concerning Availability and Reliability of DSAS)
- B5.59 - Requirements for Near-Process Intelligent Electronic Devices
- B5.63 - Protection, Automation and Control System Asset Management
- B5.64 - Methods for Specification of Functional Requirements of Protection, Automation, and Control
- B5.66 - Cybersecurity requirements for PACS and the resilience of PAC architectures
- AG D2.02 Cyber Security

The Technical Brochure to be published will be aimed at stakeholders of PACS, providing them with a guide to reliability issues, methods of evaluation in order for them to be able to make informed judgements regarding their systems.

Deliverables:

☒ Technical Brochure and Executive summary in Electra

☒ Electra report

☒ Tutorial[5]

Time Schedule: start: March 2019 **Final Report**: November 2022

Approval by Technical Committee Chairman:

Date:December 18th, 2018

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

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
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 (ref. 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

Table 3: Potential benefit of work

1	Commercial, business or economic benefit 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 direction
5	Guide or survey related to existing techniques. Or an update on past work or previous Technical Brochures
6	Work likely to have a safety or environmental benefit