CIGRE Study Committee B3

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG [1]N° B3.58	**Name of Convenor:** John Nixon (United Kingdom) **E-mail address**: john.nixon1@ge.com
Technical Issues #[2]: 10	**Strategic Directions #[3]: 2,3**
The WG applies to distribution networks[4]: Yes	
Potential Benefit of WG work #[5]: 3	
Title of the Group: Knowledge Transfer of Substation Engineering and Experiences	

Scope, deliverables and proposed time schedule of the WG:

Background:

Modern day electric transmission and distribution networks were developed over the last half century while expanding over vast areas and has progressed at a tremendous speed and progress. The historical establishment of WG's in SC B3 provided a forum for intensive discussions and collaboration amongst various stakeholders to share their experiences in trouble shooting and reliability improvements in substations.

These sharing of ideas, experience, problems, etc. within B3 created a library of technical documentation capturing the knowledge of experts and enabled stakeholders to expect longer asset lifetime beyond several generations (both equipment asset generations and operator generations). The continuation of the process to transfer acquired knowledge and dissemination of experience to the next and future generations highlights:

1. Knowledge transfer in the utility industry is becoming a critical issue due to a continuous restriction regarding human resources among younger generations and the retiring workforce. A concentrated effort is needed to ensure practical knowledge of designing, building, maintaining, operating, retrofitting, extending and removing/disposing of substations and other electrical installations, is methodically and unambiguously transferred.

2. Continue with the B3 study and discussions as to how utilities, service providers and manufactures do, can and must ensure successful knowledge transfer as it is a worldwide issue in the power system industry.

3. Some of the main issues that must be addressed are:

   3.1. Life cycle of substations (at the same location) will be more than 60 years, 3-4 generations will be involved in the management and evolution of those substation assets. How will knowledge and experience be transferred?

   3.2. Technology in substations has moved from electro-mechanical to digital and software, revolutionising the world of substations and their communication. In the future even more will be introduced as the world of digital technology develops and the previous technology is no longer produced yet will remain in-service for years to come. Before any transfer can take place, the utility industry must review available knowledge and scope, and upgrade them to meet the expectations for modern societies. The utility industry must pass forward prudent techniques and engineering fundamentals to ensure continuity of existing substations while creating the substations of the future. Actions to achieve this goal will be the recording of

institutional knowledge in the industry so new generations can understand and rationalize the trends for applying similar engineering philosophy for the future.

3.3. Identify mandatory technologies and knowledge for short-term, medium-term and long-term transfer.

3.4. Replacement of existing infrastructure with modern replacements, including spare parts.

Scope:

1. A review of knowledge transfer at each stage of substation planning / design / construction / commissioning / operation & maintenance / retrofit and disposal. The purpose is to develop a focused training program that goes beyond the fundamentals taught at the universities.

2. Also, transfer methodologies will be discussed, such as:

   (a) Veteran to young engineer mentoring
   (b) Department to department processes
   (c) Responsibility to new employees
   (d) Industry knowledge sharing
   (e) National and International sharing
   (f) Historical communications between manufacturers and utilities

3. The introduction of next generation tools useful for knowledge transfer such as 3D modelling, digital communications, social media, etc.

4. Finally, how can the industry partner or integrate educational activities with universities, utilities, manufacturers, research institutions and laboratories. How do we leverage international organizations such as CIGRE, IEC, IEEE, etc. to take advantage of the talent and resources for continuity of future generations of substation engineers?

5. Q&A Survey will be carried out for:

   (1) Planning for experience and knowledge transfer that is already being done.
   (2) Important items of knowledge to be transferred and how the transfer is done.
   (3) Tools for knowledge transfer.
   (4) Develop stakeholder process maps to include all industry relationships.

Deliverables:

☒ Technical Brochure and Executive Summary in Electra

☒ Electra Report

☒ Tutorial[6]

☐ Webinar[6]

Time Schedule: start: March 2020 **Final Report**: March 2023

Approval by Technical Council Chairman:

Date: January 10th, 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.